

THE PRACTITIONER

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JULY—DECEMBER 1944

THE PRACTITIONER
5 BENTINCK STREET, LONDON, W.1

1944

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MORTALITY AND MORBIDITY IN TUBERCULOSIS

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INTRODUCTORY

THE statistical problems involved in the modern outlook on tuberculosis are numerous and difficult. During the third decade of this century attention was directed mainly towards attempts to define the clinical stages of pulmonary tuberculosis, to decide whether or not sanatorium treatment improved the survival rate, and to establish the relative importance of inherent susceptibility and exposure to infection. Advances in radiology and tuberculin testing have tended since then to divert interest to the preclinical stages of the pulmonary form of the disease. The failure to prove that institutional treatment without after-care resulted in better ultimate survival than other methods, the introduction of artificial pneumothorax and the success of the Papworth experiment have been followed by a more balanced outlook upon treatment and increased realization of the importance of rehabilitation. Further advances towards an understanding of the parts played by environment and occupation were made by a new analysis of the national statistics of mortality amongst wives as well as amongst employed males (Registrar-General, 1938). There is a modern tendency to ignore the existing statistical evidence about heredity, derived from the incidence of conjugal and familial tuberculosis, studies of twins, and laboratory work on animals. For this attitude there is no justification, but further statistical research is needed to elucidate the importance of inherent resistance in primary and secondary infection.

The beginning of miniature radiography will result in mass statistics full of pitfalls for the unwary, and it is urgently necessary to establish standard definitions of the descriptive terms which are being used in recording the results of morbidity surveys, and to arrive at an understanding of the hitherto neglected national statistics of notification and what they can tell us about incidence. Unless this can be done, mass radiography will, from the statistical aspects, result in a welter of contradictory figures. In this article attention must be confined to these two aspects of morbidity and to the war-time increases in incidence of and mortality from respiratory tuberculosis.

CLASSIFICATION AND DEFINITION

The Medical Research Council's Provisional Classification of Diseases and Injuries (1944) has recently been published, and during its preparation it has been used for the statistical analysis of the diagnoses of patients admitted to Emergency Medical Service hospital beds during 1942 and 1943. The section of the classification dealing with respiratory tuberculosis, drawn up in consultation with experts, was designed to embrace the subclinical stages and radiological signs as well as the clinical varieties of the disease. It is reproduced in outline in an appendix (p. 10) in the hope that it will be used as a standard framework for statistics of the morbidity of the disease. This does not preclude further subdivision of the groups or condensation into a smaller number, but it does mean that the contents of each group as defined in the classification must be adhered to in order that the same group title may have the same meaning when used by different workers. Some may consider that one or more of the titles used ought to mean something else than as presented in this list, but unless individual workers are prepared to make some sacrifice of individual points of view in order to secure uniformity of definition, statistical research on the morbidity of tuberculosis will often be sterile, and much effort and money may be wasted on still-born plans to eliminate the disease. It is of the utmost importance, for example, to maintain the distinction between the person with radiological signs but no clinical manifestations (No. 0280-0283 in the list) and the patient who has both, and to refrain from diagnosing "active" tuberculosis upon insufficient evidence. Another difficulty arises from the diversity of practice with regard to pleurisy, some forms of which are consistently notified in one area and not in another. The classification does not help here, since the difference is generally one of opinion as to when pleurisy should be regarded as tuberculous and when it should be given the benefit of the doubt. For the sake of comparability some more definite ruling seems to be needed on this question.

It is sometimes asserted, on what evidence I do not know, that notification figures represent only one-half of the real cases of respiratory tuberculosis. This means nothing unless what constitutes a "case" is clearly defined. Possibly 400,000 persons in England and Wales become tuberculin positive annually, if they have recognizable symptoms in the process are they included? A number, at present unknown, develop secondary lesions detectable by radiology but without symptoms, others have slight symptoms which disappear without treatment or before the medical attendant has decided whether or not to notify. Which of these are "cases"? Finally, some reach the present notifiable standard but for various reasons escape notification. It will be shown that this last group must number about one to every ten who are notified. Mass radiography, as it develops, will gather in some of this missing tenth, but without affecting the fatality rate as defined in this article. If it gathers any of the other groups into the notification net, the new notifiable standard will gradually become different from the present one and the fatality rate will fall in consequence. If the medical practitioner is to perceive whether he is going, a clear definition of boundaries at this stage is evidently important.

NOTIFICATION OF TUBERCULOSIS

Although tuberculosis has been notifiable for over thirty years, little use has been made of the accumulated records for statistical research. For this there are several reasons. Prejudice against notification had to be overcome in the early years and it was difficult to estimate how complete it was. Many people were certified as dying from tuberculosis who had never been notified. Notified persons removed from one county to another and it was difficult to know whether, if they came under treatment in the second county, there was duplication in the statistics or not. Some were de-notified after further examination. The criterion for notification of pulmonary tuberculosis was known to vary in different areas, and local "epidemics," particularly amongst school children, were found to coincide in some instances with the movements of certain tuberculosis officers. All this was inevitable whilst a new branch of the public health service was being built up, but a position of sufficient stability had been reached before the war, for notification records to be regarded seriously as statistical material.

In the first few years of notification the numbers of persons notified annually could not be regarded as measuring the incidence of the disease, since a gathering-in of the existing tuberculosis population was in progress. The numbers notified for respiratory tuberculosis fell rapidly from 1,107 hundreds in 1912 to 735 in 1915, and during the following war years the fall was arrested, probably owing to increased incidence. From 727 hundreds in 1918 the annual notifications declined again to 534 in 1923 and then increased to 566 in 1925. From that year the fall was almost continuous until 1936, when 393 hundreds were notified, and after a temporary rise in 1937, the lowest number so far notified in a year (349 hundreds) was reached in 1939. The tide of incidence then turned, successive years from 1939 to 1942 having 349, 362, 395 and 406 hundreds, and for 1943 a provisional estimate of 425 can be made. Thus, during the first four years of war, annual notifications have increased by about 75 hundreds, whereas if the rate of decline between 1933-35 and 1937-39 had continued, the numbers in the successive years 1940 to 1943 would have been 350, 338, 326 and 314, producing a decrease of 36 hundreds between 1939 and 1943. Roughly there was in the four years 1940-43 an excess of some 26,000 notifications above the number expected if the rate of improvement in the pre-war period had continued, of 18,000 above the number expected if the 1939 level had remained unchanged, and of 13,000 above the number expected if the 1938-39 mean level had been maintained. In addition, there was an excess of about 3,000 in the total deaths of persons who had escaped notification over the number expected at 1938-39 level.

Before seeking explanations for the war-time increase in notifications it is necessary to arrive at an estimate of the living population in 1938 of persons (1) who had at some time been notified as suffering from pulmonary tuberculosis and (2) who were suffering from active pulmonary tuberculosis but through lack of medical attention or by omission on the part of their medical advisers had not been notified. In order to do this it is necessary to assume that the statistics of deaths certified under the present system as being primarily due to respiratory

tuberculosis are reliable, and that no considerable numbers die in reality from this cause whilst being certified as dying from some other. Under the system of classification which came into force in 1940, whenever the certifier states as his opinion that tuberculosis was the starting-point of the train of pathological events which ended in death, and was not merely a contributory condition outside that sequence, the death is classed as tuberculosis. Respiratory tuberculosis is mentioned as contributory in this sense to about 4 deaths for every 100 classed as the disease, and consequently the statistics represent about 96 per cent of all death certificates on which respiratory tuberculosis is mentioned. Formerly, by the old system of classification by rules of precedence, the statistics represented about 99 per cent of the total certificates with mention of respiratory tuberculosis. Throughout this discussion the deaths for all years are classified by, or have been corrected to, the new system.

RATES OF DYING AFTER NOTIFICATION

In the five years 1929-33, 10 per cent of persons dying of respiratory tuberculosis had not been notified as suffering from the disease, and in 1934-38 the proportion who had escaped notification was 9 per cent. Assuming that the proportion during 1922-28 was 10 per cent, the deaths of notified persons in each year from 1922, when formal notification began, can be calculated and related back to the numbers of notified persons at risk. This has been made more exact by an analysis recently made by Lewis-Fanning (1943) of the intervals between notification and death from respiratory tuberculosis in a sample of 2,201 deaths from this cause in Middlesex County in 1937-39. The intervals were distributed in proportions of about 42 per cent under one year, 45 per cent one to four years, 10½ per cent five to nine years and 2½ per cent ten years or more. By relating the deaths from the disease in England and Wales during 1937-39 of persons who had been notified to the numbers of notifications in the appropriate periods between 1922 and 1939, it was found as a first estimate that the rates of dying from the disease after being notified were—22·2 per cent dead within one year, 44·2 per cent within five years, 48·6 per cent within ten years and another 1 per cent after ten years. By fitting a smooth curve to these rates and adjusting it to produce the correct numbers of deaths in 1937-39, the following rates of dying in the pre-war period (table 1) were obtained (Stocks and Lewis-Fanning, 1944).

TABLE 1
PER CENT DEAD OF RESPIRATORY TUBERCULOSIS WITHIN A YEARS AFTER BEING NOTIFIED

x	Per cent dead	x	Per cent dead	x	Per cent dead
1	22·2	6	46·0	11	49·2
2	31·2	7	47·1	12	49·4
3	37·5	8	47·9	13	49·6
4	41·5	9	48·5	14	49·8
5	44·5	10	48·9	15	49·9

For simplicity it was assumed that the last 1 per cent. all died between the tenth and fifteenth years. In order to check the applicability of Middlesex data to the country as a whole the same process was carried out for that county alone, correcting for the incoming population notified elsewhere, and a similar curve was obtained but at a lower fatality level ending at $43\frac{1}{2}$ per cent. dead of the disease instead of 50 per cent. This is consistent with the finding (Registrar-General, 1935) that in Middlesex county, standardized mortality from the disease in 1931-35, was about 86 per cent. of that in England and Wales.

It is generally supposed that fatality was falling during the period between the two wars and this was tested by a simpler method, relating each year's deaths of notified persons in England and Wales to $\frac{1}{2}$ (notifications in same year + twice the notifications in the year preceding + notifications in the two years before that). This resulted in the following average percentages of the notified who died eventually of the disease, as calculated from deaths in the successive periods named: 50 per cent. in 1924-7, 1928-31 and 1932-35, 51 per cent. in 1936-37. The fatality rate after notification therefore remained constant over the period 1921 to 1939.

It may be stated, then, that the expectation of eventually dying of pulmonary tuberculosis as certified cause was, for the average person living in the inter-war period who had just been notified, almost exactly one-half, the risk of dying of the disease within a year was about 22 per cent. and in successive years thereafter it was about 9, $6\frac{1}{2}$, 4 and 3 per cent., giving an expectation of dying within five years of notification of $44\frac{1}{2}$ per cent., after five years the additional risk was only $5\frac{1}{2}$ per cent. It is interesting to compare these rates of dying with those found by Thompson (1943) for patients after tubercle bacilli had been found in their sputa, namely—40 per cent. within a year, 17, $6\frac{1}{2}$, 6 and $3\frac{1}{2}$ per cent. in the next four years, giving 73 per cent. dead within five years, and 86 per cent. dead within ten years.

A study of the notification statistics of England and Wales for 1938 shows that the mean age at time of notification for pulmonary tuberculosis was thirty-six years for males and thirty years for females. The mean ages calculated from all deaths were forty-two for males and thirty-five for females,¹ but the difference does not give the mean duration from notification to death, as was assumed by Bogen (1939). The total deaths included people who had never been notified, whose average age was higher, and the mean ages at notification of those who recover and those who die of the disease are not necessarily the same. The mean duration between notification and death, calculated from the rates of dying given above, was 2.2 years.

TUBERCULOUS POPULATION IN 1938

The effects of eliminating respiratory tuberculosis upon survival from various ages were calculated by Karn (1931), and by means of her results applied to the combined life tables of 1921-23 and 1930-32 it is possible to estimate the expectations of dying before 1938 from causes other than pulmonary tuberculosis for persons aged thirty in each year from 1912 onwards. It may be assumed that a person just notified is subject to the special risks of dying of respiratory tuber-

culosis already calculated plus the ordinary risks of dying from other causes and by applying these combined risks to the numbers notified each year after formal notification started in 1912, the total survivors in 1938 can be estimated. The resulting total is 740,000 and, allowing some deduction for persons notified more than once or notified at advanced stages in the early years of notification, it appears that upwards of 700,000 persons were living in 1938 who had at some time been notified as suffering from pulmonary tuberculosis. Since one died without prior notification to every ten who had been notified, there were probably another 70,000 living who were, or had been at some time, of notifiable standard but had escaped notification. The mean age at death of the unnotified was found by Lewis-Fanning from the Middlesex records to be higher by about ten years than of those who had been notified, which suggests that this group included many older people left unnotified during life as "chronic bronchitis".

Most of this total of three-quarters of a million with history of active pulmonary tuberculosis must have been in a healed or quiescent state. The number expected to die eventually of the disease is found by multiplying the notifications in 1938, 1937, 1936, by the expectations at 0, 1, 2 years after notification and summing the products. This gives about 55,000 who had been notified, to which total must be added perhaps 6,000 who had escaped notification. The bulk of these, who were going to die of the disease, would remain in a clinically active state throughout, and in order to arrive at an estimate of the total persons with active pulmonary tuberculosis at a given moment, to this group must be added the patients who were temporarily active but going to recover. This latter number could be readily estimated if the average interval between notification and healing were known, if it is one year, then since some 20,000 were being annually notified who were going to recover, there would be 20,000 of this group in an active state at any moment in 1938, if it is two years, there would be nearly 40,000. Adding these to the 55,000 progressive cases the totals amongst notified persons are alternatively 75 or 95 thousands. There were on the dispensary registers at the end of 1938 about 138,500 persons under observation for the disease, and from 72,000 tubercle bacilli had been recovered. It seems reasonable to estimate the total of clinically active persons at a given moment in 1938 as between 80 and 100 thousands who had been notified and about 10 thousands who had not been notified.

Summarizing the estimated position in 1938, there must have been at any one time in England and Wales about 100,000 persons with clinically active pulmonary tuberculosis and about 650,000 in a healed or quiescent state, and of this total about 60,000 were expected to die eventually of the disease. Expressing these in rates, out of 10,000 persons taken as a cross-section of the whole population about 24 would have been found to be clinically active whilst about 160 would have been at some time of notifiable standard and become healed or quiescent, and of all these about 15 would be expected to die of respiratory tuberculosis at some time in the future.

Shiagraphic surveys have so far been limited to highly selected sex and age groups, and rates of active tuberculosis deduced from them cannot be compared with those estimated above. Furthermore, the definition of "active" as so deter-

mined may embrace a wider field than "notifiable" in ordinary practice. In a skiagraphic survey of 100,000 Australian Army recruits (Galbraith, 1941) 5.6 per 1,000 were found to have active and 4.8 latent tuberculosis, but in young adults a higher rate of the former and a much lower rate of the latter would be expected, so the figures are not necessarily inconsistent with about 2½ and 16 at all ages. Amongst 75,000 R.A.F. recruits (Evans, 1943), already selected by ordinary medical examination, 0.9 per 1,000, found as a result of radiography, had positive sputum and 1.1 per 1,000 were sputum negative with some symptoms, whilst 5 per 1,000 showed signs of inactive disease. The notification rates per 10,000 living in 1938 were, amongst males 14.7 at ages fifteen to thirty-four compared with 10.8 at all ages, and amongst females 17.5 at ages fifteen to twenty-four compared with 7.7 at all ages, and consequently the frequency of active pulmonary tuberculosis amongst unselected young adults is probably about twice as great as in the population of all ages. Amongst unselected young adults about 4 or 5 per 1,000 of notifiable standard may be expected, and a somewhat higher proportion may be classified as "active" from radiological ascertainment.

WAR-TIME EXCESS OF NOTIFICATIONS

Having defined the position in 1938 it becomes possible to understand better what the rise in notifications since 1940 signifies. The annual totals of new formal

TABLE 2

Sex, age	Numbers notified (hundreds)			Change from 1938-39 level, in hundreds		
	1938	1939	Mean	1940	1941	1942
<i>Males</i>						
Under 15	15.6	11.9	13.7	-2.7	-1.3	-0.2
15-19	20.7	20.9	20.8	+0.2	-2.3	-3.5
20-24	25.6	23.9	24.8	-2.8	+2.9	-4.4
25-34	45.6	42.7	44.2	-6.6	+8.8	+5.5
35-44	38.8	36.0	37.4	+1.0	+7.8	+10.7
45-54	34.5	31.8	33.1	-1.2	-4.0	+3.5
55 and over	32.2	29.8	31.0	-1.8	+2.0	-3.4
All ages	213.0	197.0	205.0	-4.9	+26.5	-31.2
<i>Females</i>						
Under 15	14.9	11.9	13.4	-2.3	-1.6	-1.1
15-19	26.3	25.9	26.1	-0.2	+1.1	-0.8
20-24	31.0	29.0	30.0	-0.9	-3.1	-9.3
25-34	45.1	41.0	43.1	-0.5	-0.7	-1.7
35-44	23.0	21.8	22.4	-1.1	0	+0.7
45 and over	25.5	22.8	24.1	-2.4	+1.2	-0.4
All ages	165.8	152.4	159.1	-7.4	+4.5	+11.0

notifications in successive years 1931 to 1942 for pulmonary tuberculosis were, in hundreds —495, 466, 445, 430, 396, 393, 396, 379, 349, 362, 395, 406. Using the mean incidence in 1938–39 as basis, the changes from this level in 1940, 1941 and 1942 at different ages are shown in table 2.

In 1940, when males between the ages of twenty and forty were being called up for service, the excess in notifications was confined to those groups, other males showing deficiencies in common with females of all age groups. In 1941, when males under twenty and females between twenty and thirty began to be called, an excess appeared in those groups also, and it also appeared amongst males above the calling-up ages. In 1942 two-thirds of the total excess amongst males was concentrated at the ages of twenty to forty-four and the excess amongst females was concentrated at ages twenty to thirty-four.

The figures suggest that some 5 or 6 thousands, or as many as three-quarters of the excess of pulmonary notifications during 1941–42 over the 1938–39 numbers, arose through notification under the exigencies of national service of people who, either through lack of medical supervision, tardiness or deliberate omission, would normally have escaped being notified altogether or until a later year. This can hardly explain more than a fraction of the continued excess in 1943, however, and, as already stated, there was a total excess in 1940–43 of some 13 thousands over the number expected if the 1938–39 level had been maintained. Probably about half of the war-time increase so far recorded, if 1938–39 base level is used, may be attributed to this cause.

With regard to notifications of other forms of tuberculosis, which were also declining in pre-war years, the annual totals in hundreds from 1938 to 1942 were 128, 113, 104, 115, 120, the lowest level being attained in 1940, followed by an increase. Provisional figures for 1943 indicate that the total will be about the same as in 1942.

WAR-TIME EXCESS OF DEATHS

In the period from 1871 to 1910 the male standardized death rate from respiratory tuberculosis was falling by 17 per cent and the female rate by about 23 per cent every ten years. In the decade including the last war the improvement over 1901–1910 rates was only 4 and 9 per cent., but 1921–30 showed 33 per cent fall for males and 22 per cent for females. Comparing the 1932–39 period with 1921–30, the ten-year interval registered 27 and 29 per cent improvements respectively. For non-respiratory tuberculosis the standardized rates were falling by about 38 per cent per ten years in the inter-war period.

Deaths from respiratory tuberculosis of persons who had been notified reached the low level of 19.4 thousands in 1938, and in the next five years, 1939 to 1943, numbered 19.7, 21.4, 20.8, 18.4 and 18.8 thousands. Deaths of unnotified persons numbered in these six years 1.9, 1.8, 2.2, 2.9, 2.6 and 2.5 thousands. By applying the pre-war rates of dying at successive intervals after notification it appears that had the incidence of notified pulmonary tuberculosis continued to decline at the same rate as it did between 1933–35 and 1937–39, there would

have been 6,000 fewer deaths in 1940-43 than the total expected from the actual notifications. In other words, the effect of the new incidence produced by the adverse conditions of the war years has been to cause about 6,000 deaths up to the end of 1943, and since, as shown above, the real excess of incidence probably amounted to some 20,000 of notifiable standard, half of whom were expected to die of the disease eventually, a debt of several thousand deaths has still to be paid from this part of the account.

Apart from new incidence, the severities of 1940-41 enhanced the immediate fatality of patients already suffering from the disease, with resulting increase of deaths in those years of about 4,200. Of these about half would normally have died in 1942-43, as indicated by a compensatory fall of deaths below expectation in those years amounting to about 2,200. The balance of the 1940-41 excess probably consisted of persons with quiescent lesions who in normal circumstances would not have died of the disease at all, or with slowly progressive disease who would have died of it after 1943. In addition, about 1,000 unnotified persons died in 1940-41 of respiratory tuberculosis in excess of expectation, drawn probably from immigrants, the mercantile service and others who had escaped notification through abnormal population movements.

Now that the trough of fatality following the premature deaths of patients in 1940-41 is nearly spent, the secondary wave of deaths due to incidence rising instead of falling is likely to become apparent. Using a continuation of the pre-war trend as base line, it began some time back, or using the more usual horizontal base line and applying seasonal correction factors to the quarterly figures, it began to appear in the summer of last year. The influenza epidemic in the December quarter intensified the rise, bringing the 1943 total to 350 above that of 1942. The future trend of deaths depends upon how soon the unsatisfactory trend of incidence can be halted and turned downwards again, or whether or not some progress can be made towards reducing the fatality of notified respiratory tuberculosis below that 50 per cent which persisted despite all efforts during the inter-war years.

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tions Not every case proved to be tuberculous will be of early extent, but only some third of the total are likely to be considered active Those examined are the supposedly healthy, and conditions are brought to light for which they have felt no need of advice, and much less of treatment There is little to serve as a guide on expectation of life based on extent of lung involvement alone, entirely dissociated from the toxæmia which was the prime cause for its recognition On the other hand, the critic who complains that mass radiography is making an unnecessary fuss about symptomless disease is merely destructive, unless he follows with proof that this leads to unnecessary treatment, or to harmful worry to large numbers of the population who need never have known that they have healed lesions He is as wide of the mark as the critic who states that the appearance of symptoms is coincident with the onset of activity Experience has shown that some 35 per cent of those suspected because of abnormal films, and later considered active on physical and bacteriological examination, are without symptoms on the closest questioning Pain, dyspepsia and night sweats are the discomforts that compel the visit to the surgery and the dispensary They are the foundations of the classical history, but are almost without exception synonymous with disease that warrants a grave outlook The symptoms associated with an earlier stage—cough, dyspnoea on exertion, and unusual lassitude—are often ignored or misread by the patient, and even they are in no wise indicative of the age of the disease The only conclusion possible is that the consciousness of any symptoms means a failing or lost individual resistance, for which as yet there is no means of assessment for so long as it is maintained After its breaking point it may defy all attempts at restoration, its loss is the reason for prolonged bed-treatment for many patients who have otherwise all the indications for collapse therapy It appears to have no relation to the extent of the lesions In one case, it disappears when all that is found is an "Assmann's focus", in another it is sufficiently maintained to lead to a diagnosis of chronic bronchitis instead of fibrocascous, or senile pulmonary tuberculosis

EARLY DIAGNOSTIC VALUE

With mass radiography the approach of the physician to the abnormal is the reverse of that to which he has been accustomed He sees X-ray evidence of abnormality before he questions and examines the suspect Up to now, symptomless active tuberculosis has been a comparatively uncommon finding, and the records of morbid anatomists on the prevalence of healed lesions have had but little bearing on clinical practice Examination of large numbers of the apparently healthy population shows there is an alarming amount of unsuspected disease at all ages For that considered active there is a rising curve of incidence in adolescent and early adult life, and, after a comparative fall to the mid-thirties, a continuing steep rise to old age Throughout life, the incidence of inactive disease is roughly double that of active disease An interesting point is that a rise in the active curve in the age group thirty-nine to forty-four cannot be explained by mere re-activation of formerly inactive lesions But there are no figures to show whether or when those considered inactive would have been considered active at an earlier examination Little is so far known about the natural healing of tuberculosis

It follows that the physician whose duty it is to make decisions on those first

suspected by miniature radiography will depend on criteria which are individual to himself. He will base his diagnosis of active disease on the physical signs which in his past experience were an accompaniment of the toxæmia that compelled the patient to seek his advice. When he finds no physical signs he will be influenced by his individual interpretation of the film, and by the answers to his direct questions on the classical symptoms. He will inevitably increase the work of the dispensaries, some of it, time and experience may show to have been unnecessary. But his greater responsibility is to the suspect, who may by his decision become a patient. The diagnosis of early tuberculosis was never easy; it cannot be expected to become suddenly easier. A new infallibility must not be demanded. Wrong answers to the old problems will still be given, and new problems are bound to be created. There is no use denying that the risk of a new class of the "chest-conscious" must be faced, there will be a type of suspect who will develop anxiety neurosis and self-made symptoms merely because he is recalled for a large film. Now and again the method may even aid that re-activation of quiescent disease which all are so anxious to avoid. Against this must be offset the desire to find active tuberculosis before it has destroyed resistance, at that point when adjustment of hours of work, the proper use of leisure, immediate rest or even active treatment will forestall the stage to which the average case has arrived at first diagnosis. If this fails, mass radiography fails, it has not fulfilled the functions for which it was introduced.

GENERAL SCHEME OF PROCEDURE

Certain broad principles should be laid down for consistent working throughout the country. It is taken for granted that no unit will begin operations until complete arrangements are made for ultimate diagnosis. The tuberculosis suspect will be dealt with through the dispensaries, by the way of his own practitioner; "observation beds" would be a great advantage to the tuberculosis officer. Similar arrangements could be made for non-tuberculous conditions, such as bronchiectasis, and for heart conditions, by a liaison with the staff of the nearest general hospital, to whom the patient's family practitioner could be advised to refer his patient for investigation. Such a scheme would help in the "follow-up" of all abnormalities noted by the unit director and act as a corrective for his future decisions.

INTERPRETATION OF CLINICAL AND X-RAY FINDINGS

Criteria on the interpretation of the physical and radiological findings will have a direct bearing on the problems of disposal. Figures that may be published later on this aspect of mass radiography in the fighting Services cannot apply with real help. There, disposal has two boundaries only, unfitness for acceptance and fitness for continuance in the specific duties of the personnel examined. A man may be fit for his duties as a civilian clerk, but totally unsuitable for an air-crew.

Two examples of the linking up of all three aspects of radiological interpretation, physical findings and resultant disposal will serve to illustrate the questions which the director of a unit may have to answer. When an ill-defined rounded loss of translucency in an outer infraclavicular area in a subject aged eighteen is read as an "Assmann's focus," some physicians will consider it as evidence of active

disease, even in the absence of physical signs, and will advocate artificial pneumothorax. Others will be content with out-patient observation. Again, it is the belief of some sanatorium superintendents and chest surgeons that the future safety of the patient with unilateral cavitation and much mediastinal shift lies in thoracoplasty, in spite of the fact that the patient is not toxic. General direction is needed on disposal as between "no action taken," "dispensary supervision" and "residential treatment." It is no answer to say that the onus is on the tuberculosis officer to whom the case is referred, for this is but postponing the answer involved, and implies an unjustifiable burden on the dispensaries. These will already be all too busy with the "anomalous cases," which may fall into one of two main classes. First, they may be of known pathology but doubtful activity, e.g., tuberculosis apparently quiescent but in a dangerous age group, secondly, they may be of doubtful pathology, e.g., a peripheral upper-zone X-ray lesion may be found that only serial examinations will place as tubercle or "partial" pneumonia.

Agreed criteria on what is already known about the interpretation of radiological and physical findings would be a distinct forward step, a working hypothesis would be better than none. A prime necessity is uniformity in the production of miniature films. Modern apparatus can give an excellent result but it should be made comparable in all units all over the country. For full-sized films accepted standards in positioning, exposure and processing for postero-anterior, antero-posterior, lateral and lordotic views are needed.

This might lead to definition of abnormal shadows. Those consistent with advanced disease are well recognized, but help is needed in the language of description and interpretation of what is thought to indicate earlier disease. It should be possible to link up varying densities and their distributions in particular areas of the lung fields with their underlying pathology, and perhaps even with their immediate pathogenesis. The same arguments apply to agreement on the significance of physical findings. The stethoscope will not after all be buried. Increased facilities for X-ray examination will surely bring a renewed interest in clinical findings, which must give the ultimate answer in a large proportion of cases. Thousands of sufferers from tuberculosis are without physical signs while the disease is active, thousands have physical signs while the disease is undoubtedly inactive. There are many who present abnormal findings of no generally accepted meaning. There will be agreement that most rales heard in the infraclavicular or axillary regions justify a diagnosis of activity, but whilst some read these as late signs of breaking down of well-established disease, others take them as the only certain sign that the disease is active and go no farther in interpretation. There appears to be too much subdivision in the nomenclature for clear thinking, fewer terms that could be related to definite underlying pathology would be a distinct help.

NEW FORMS OF TREATMENT

It is necessary to be prepared for new forms of treatment for the new class of the tuberculous. The symptomless patient will resent the proposal of sanatorium residence, indeed it might do him considerable psychological harm. The "negative sputum" or "no sputum" cases will not welcome segregation with the positive cases. Many who have abnormal X-ray findings, but no definite evidence of active

disease, will have to be dealt with under dispensary observation. It may be that some will be able, by advice on rest and recreation and by re-arrangement of duty hours, to continue with their own work during and after such observation. There will be those, however, who are obviously in a trade unsuited to their condition, they will require re-education.

In such cases, the system of occupational therapy as practised in most modern sanatoria will have to be re-adjusted to some form of therapeutic occupation. They will need assessment of their working capacity by physiological tests, help to adapt their past training to their new training, and continual survey of their response to work during rehabilitation. Therefore extension and adaptation of methods at present in use in our established village settlements are needed. Full use will have to be made of the past experience of the rehabilitation of the "quiescent" and "good chronic" sufferer, since, in the main, any new scheme will be comparative to the stage between sanatorium treatment and colonization as now practised at Papworth. Apart from the initial expense, this should be comparatively easy, provided the claims of the tuberculous are fully understood by those administering the Government's proposals as laid down in the recent bill for the employment of the disabled.

CONCLUSION

Mass radiography will do much for the future physician if it leads to the foundation of a central school for research on the normal and the abnormal. The school could collect and compare the findings of individual observers and keep criteria of radiological and physical diagnosis up to date. For example, it should be possible to collect serial films of large numbers of individuals from childhood to adolescence and eventually to old age. The school could note the many variations of the normal film, linking these with intensive study of anatomy, histology and physiology. It could compare abnormal shadows with morbid pathology. It would then be in a position to direct investigation on many questions which cannot be answered from present knowledge. Thus it is already suspected that the primary focus of tuberculosis is not essentially acquired only in infancy and childhood. It is possible that this has some bearing on the incidence of subsequent pulmonary disease. Some sort of time-interval may be found between the Ghon's focus of childhood and the adolescent deposit that will correspond with the interval between a later primary and the pulmonary lesion of the age group thirty-nine to forty-four. In this may lie the explanation of what appears to be a "family tendency" to develop the disease in later middle age. Again, little is yet known of the true relationship of the childhood infection and the Assmann's focus. The latter may be a tertiary stage of pulmonary disease, the primary stage of which has begun as a lymphatic spread round the Ghon's node, and the secondary as an invasion of the broncho-pulmonary segment of the posterior apical branch of the upper lobe bronchus.

A new country is being developed, in the interior of which it is believed there lies a city of new hope for the tuberculous. So far it has few well-known roads, and these are straight and narrow, made for specific types of travellers. It needs new roads, to replace the tracks that meander because they avoid difficulties which cannot at present be removed. But the country is being mapped, sign-posts are being erected, and each year more and more travellers will take direct highways.

THE EARLY CLINICAL MANIFESTATIONS OF PULMONARY TUBERCULOSIS

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HAD the title of this article been "The Clinical Manifestations of Early Pulmonary Tuberculosis" its scope would have been greatly reduced, as it is only too well known that in the majority of cases the early stages of the disease produce neither symptoms nor physical signs. By routine radiography, especially in contacts, I have followed the gradual development of a lesion even to the stage of cavitation, whilst the patient has remained at work, gained weight, and been completely free from any subjective symptoms.

The programme of the modern attack on tuberculosis is developed along four main lines —

- (1) Social measures to mitigate the factors which favour the development and spread of the disease
- (2) Treatment, control and isolation of the known infective case
- (3) Routine examination of contacts
- (4) Search for unsuspected cases by mass radiography of the apparently healthy

Many years must pass, however, before these measures can produce their full effect or give a clear picture of the morbidity of the disease. Patients will continue to seek advice only when they feel ill, and it is therefore necessary to keep always in mind the conditions and grouping of symptoms which should lead to a suspicion of the disease. It is true that if the symptoms are due to tuberculosis the disease in two cases out of three will no longer be early, but even then immediate treatment may still be effective. It is still too little appreciated that tuberculosis is not a slowly and steadily progressive condition, rather is its development marked by short bursts of activity with intervening periods of amelioration, which may induce in both practitioner and patient a sense of false security. Those recurring attacks of so-called influenza followed by a few weeks of lassitude or slight cough, the one "negative" sputum test or the blood which came from the "veins of the throat," are still too frequent incidents in the history of the patient finally discovered too late for effective treatment. To temporize with such symptoms instead of insisting on immediate X-ray examination may in these days lay the practitioner open to an action for negligence. Even if a sanatorium bed is not available at once, a period of complete bed rest at home may yet make all the difference between recovery and death. Therefore if a patient's symptoms raise any suspicion of tuberculosis, an X-ray examination is essential. Early tuberculosis is "seen and not heard."

THE EARLIEST MANIFESTATIONS

Phlyctenular conjunctivitis and *erythema nodosum* are signposts of danger. The former condition is of tuberculous origin in fully 50 per cent. of cases, but is mainly an illness of childhood and is not often followed by active pulmonary disease.

It may, however, lead to the discovery of an unsuspected case of active disease in the home, and, as it indicates dissemination of infection, requires careful observation and strict treatment. Erythema nodosum in the majority of cases is associated with primary tuberculous infection and, especially when it occurs in a young adult, should call for a period of close observation.

Some months ago I was asked to see a nurse who gave a history of erythema nodosum six months previously. She had been X-rayed at the time with a negative result, but had wisely been recommended for a further film after six months. The new X-ray showed a small pleural effusion and typical tuberculous infiltration already showing evidence of cavitation. On inquiry she admitted to feeling tired for some weeks with pain in the side, but had not reported sick as she did not wish to miss the Christmas festivities and nurses' dance.

In Scandinavia, erythema nodosum is a notifiable disease and its relation to tuberculosis has been more fully recognized than in this country. It is commonly held that its appearance coincides with the onset of allergy in a recently infected individual, and therefore indicates that primary infection has occurred some four to eight weeks previously. Although some cases of erythema nodosum, about 10 per cent., appear to be unconnected with tuberculosis, it should always be regarded with great suspicion and followed up by serial X-rays at intervals of two to three months. The proportion of cases which indicate the presence of primary infection in this way is not known, but in a series of 266 sanatorium nurses observed by Heimbeck of Oslo (1928), 37 (14 per cent) developed erythema nodosum at the time when their change from a negative to a positive skin reaction indicated recent infection. Kerley (1943) in a recent paper suggests that the radiological changes seen in the chest, as well as the histology of glands and skin lesions in this disease, are more suggestive of sarcoidosis than tuberculosis. In my opinion the weight of evidence does not uphold this view, but whichever may be correct—and the relationship of tuberculosis and sarcoidosis cannot be considered to be finally settled—there can be no doubt as to the wisdom of suspecting tuberculosis in every case of erythema nodosum.

Apart from erythema nodosum it is rare, at the stage of primary infection, for the patient to develop symptoms of sufficient degree to cause him to seek medical advice. In childhood there may be a period of slight fever and lassitude, but in adults the mild symptoms of this period will probably be merely those of the common cold with an unusual degree of weakness and a brief febrile episode. Unrecognized at the time, these mild complaints may stand out clearly in retrospect. The great majority of cases, however, do not present themselves for advice until the more dramatic symptoms of the post-primary or reinfection stage of the disease become manifest.

LATER SYMPTOMS

The symptoms of this stage tend to fall into two groups. On the one hand are those which are striking and localizing, such as pleurisy, hæmoptysis, ischio-rectal abscess or loss of voice, the other group, comprising more vague conditions, such as dyspepsia, lassitude, anæmia, tachycardia, and night sweats, are often dismissed under the unsatisfactory diagnosis of a mild neurasthenia. Cough may occur early, but a pronounced and productive cough is rarely an early symptom. The old

shibboleth of "no cough no tuberculosis" has little foundation in fact. Slight fever and some loss of weight may be present in the early stages, but in the main these are characteristic of relatively advanced disease. Some of the above symptoms require further discussion.

Pleurisy should always be a matter of grave concern. Too many patients return to work following a short convalescence who are examples of early tuberculosis in a favourable stage for treatment. A follow-up of 570 cases of pleurisy proved that 42 per cent of "idiopathic" dry pleurisy and 47 per cent of pleurisy with effusion later developed pulmonary tuberculosis, among cases of proved active disease some 35 to 50 per cent give a history of previous pleurisy. These figures prove that any case of pleurisy should be regarded as probably tuberculous until proved to the contrary, and serial X-rays must be taken at intervals of a few months for the next two years. Convalescence must be prolonged and on sanatorium lines.

Hæmoptysis is the one symptom of tuberculosis which the patient rarely fails to take seriously. Cough, spitting, or loss of weight will be attributed to any cause but the right one, but hæmoptysis usually takes the patient straight to his medical practitioner. The typical features of this symptom in tuberculosis are that the onset is rarely coincident with exercise, usually it occurs at home or during the night. A tickling in the throat, perhaps a slight cough, and a teaspoonful or more of bright blood is easily cleared. This may recur several times and in most cases is followed by staining for some hours or days. Such bleeding does not come from the "veins of the throat." If blood comes from the nose as well as the mouth the source of both is usually nasal, so, too, is blood found on the pillow on waking. With the above exceptions, and if mitral disease and bronchiectasis can be excluded, such hæmoptysis in a young adult is almost pathognomonic of tuberculosis. The hæmoptysis of bronchial carcinoma is most often a long-continued staining, less bright in colour, and free bleeding is uncommon.

Many cases of tuberculosis are missed because of failure to recognize its frequent association with *ischio-rectal abscess*. Every case of this condition, and especially those which are slow to heal after incision, should be subjected to X-ray examination of the chest. Recurrent colds associated with huskiness or loss of voice also call for further radiological investigation.

The fact that pulmonary tuberculosis rarely progresses in a completely insidious manner has already been stressed, and one of the most common early symptoms is a sharp febrile attack of an influenzal type with some cough, coryza or pain in the chest. There is usually headache and pains in the back and some subsequent debility. Several such attacks may occur with increasing lassitude before advice is sought. There may be some loss of weight, slight shivering in the evening or an occasional drenching night sweat. Loss of appetite is common at this stage. These symptoms are of such everyday occurrence that they are frequently labelled "influenza," even in the absence of an epidemic. The seriousness of missing the disease at this stage is that these attacks when due to tuberculosis commonly indicate necrosis and cavitation of the early lesion, a period when active treatment is of paramount importance. An X-ray will almost invariably clear up any doubt.

About this time *cough* begins to enter the picture, at first dry, chiefly on rising, on exertion or on change of atmosphere. Sputum, if any, is at first clear and mucoid,

but later contains small yellowish-green masses, and tubercle bacilli should be searched for by repeated examinations

The most vague group of symptoms which may indicate tuberculosis are those which by their nature do not at once call attention to the lungs. The complaint may be a mild non-typical dyspepsia, persistent tachycardia or symptoms suggesting neurasthenia. Careful history-taking may elicit the association of night sweats, chilliness in the evening, tiredness and slight loss of weight, and gradually build up a symptom-complex which though possibly common to many other diseases should also arouse suspicions of a tuberculous pathology.

Too much stress must not be laid on the *physical type* and general appearance. It is true that in some people the bright eyes, malar flush, pale lips, thin neck, rounded shoulders and flattened chest may suggest the classical type, but such changes are most common in the advanced and chronic stages, the early case may well be of almost any physical type, thin or fat, tall or short, athletic or sedentary.

In summing up the symptoms it must be stressed that no single complaint is pathognomonic, all are common to many other conditions. Pleurisy and hæmoptysis are the most individual, and careful history-taking will frequently form a picture made up of many features which individually have little significance but collectively may almost clinch the diagnosis. If a history of close family or other contact with an infective case can be added, suspicion will border on certainty.

PHYSICAL EXAMINATION AND OTHER INVESTIGATIONS

It has been said that the stethoscope is still a valuable instrument so long as there are no holes in the rubber, no wax in the meatus and no prejudice in the mind of the user, but the last twenty years have seen a complete eclipse of the whole art of chest examination by the remarkable advances in radiology. It is a matter of daily experience to see a patient with obvious radiological evidence of disease which provides little or no evidence of its presence to the most skilled physical examination.

Such physical signs as may be found by clinical examination of the early case are all common to many other chest conditions, and are those produced by condensation or collapse of small areas of lung with or without some element of catarrh. Their significance depends mainly on *localization*. Thus retraction and hollowing of one apex may be found, with wasting of the muscles of the shoulder girdle. Percussion may reveal loss of note in this area or even hyper-resonance. Changes in the breath sounds are those indicating interruption of free vesicular expansion, and are shown by slight harshness and raised pitch of the inspiratory sound and sometimes by cog-wheel breathing. The most significant finding is a small area of persistent moisture with a shower of fine crepitations heard in the early inspiratory phase and probably elicited only during the sharp intake of breath immediately following a short cough. Such post-tussive crepitation in someone already suspect by symptoms is the nearest approach to a pathognomonic sign of tuberculosis. The area of lung involved in these early changes may be situated in any zone but most commonly is in the posterior part of the apex at the level of the spine of the scapula, and it is over this spot that physical signs are most

frequently found. It cannot be too strongly stressed that complete absence of physical signs, even by the most expert examination, does not exclude tuberculosis.

Sputum examination must never be neglected, even in the presence of apparently convincing evidence from other directions. The detection of tubercle bacilli is the only absolutely certain proof, and repeated tests must be made so long as material is available. If direct testing by the smear method should fail to detect bacilli, recourse should be had to concentration methods, which may be further supplemented by culture or guinea-pig inoculation. By these methods a considerable addition can be made to the number of positive findings.

The temperature—In the absence of positive evidence from sputum tests, valuable corroboration of suspected disease may be obtained from careful temperature records. The temperature in tuberculosis is typically irregular, and is easily influenced by exercise or even by emotional upsets. Small variations can only be detected by careful technique, mouth readings are suitable, although slightly less accurate than rectal. The best times for recording are (1) on waking, (2) at 6 p.m., and (3) at 9.30 p.m. The afternoon reading is important, as a rise at that time is not uncommon and may be missed by the ordinary diurnal record. The instability caused by exercise may be used as a means of diagnosis. Half-hourly records are taken with the patient at rest, then a sharp walk of half an hour is taken followed by further recordings at rest. The healthy individual may show a rise of about one degree with return to normal in half an hour, many cases of tuberculosis will show a still greater rise which may take several hours to return to normal.

Tuberculin testing by Koch's subcutaneous method has fallen into disuse, as it was not without danger, but skin testing by the Mantoux or patch methods may be of great value in excluding tuberculosis. By the time adult life is reached, the majority of people give a positive response to this test. A positive result in an adult merely indicates infection at some previous time and has no bearing on a diagnosis of active disease, a negative test is, however, of great value, as it excludes tuberculosis from the diagnosis with a high degree of certainty.

Certain *blood examinations* may yield indirect evidence in arriving at a diagnosis. The sedimentation rate is increased in tuberculosis, although not always in the early case. The Westergren method is that in most common use and a reading above 10 is abnormal and may often be as high as 30 in one hour. The Von Bonsdorff count is a guide to toxæmia, the number of nuclei in 100 polymorphonuclear cells are counted, the normal being 275 and a reduction to 200 or lower is significant.

X-ray examination—The value of radiology in diagnosis has been left to the last as it may be argued that its use does not fall within the scope of clinical manifestations of the disease, but no investigation of chest disease can now be considered complete without the evidence of X-rays, and it is essential to discuss their paramount importance. Mass radiographic surveys of the apparently healthy elicit evidence of pulmonary tuberculosis in about 1 per cent. of those examined, and about half of these have active disease. It is not uncommon to find localized shadows, especially what is known as the Assmann's focus, some two or three years before the disease produces symptoms enough to cause the patient to seek medical

advice The most common types of early lesion as seen in the X-ray film are (1) the round or smudge focus, subclavicular, and about 1 cm in diameter, and (2) a group of small mottled opacities of about 1 to 3 mm in size, below the clavicle or in the mid-zone. Sometimes the mottling precedes the round shadow or the round shadow may develop mottling around itself. Such lesions must be closely watched by serial X-rays until they resolve or calcify, which may take six months or longer. In a recent follow-up of 39 cases of this type, Simon (1943) found that 10 resolved, 11 showed no change and 18 (46 per cent) developed into active disease. In his opinion the round focus appears more benign than the smudge or mottled shadows, the round shadows which progressed did so in an average of twenty months as contrasted with seven months in the case of the mottled type. The above groups are the earliest detectable lesions and do not present any signs or symptoms. Further changes into much more obvious lesions may occur slowly or with great rapidity and it is often possible to follow the change from infiltration to excavation in a period of only days or weeks. Through the whole course of the disease the changes, whether of spread or of healing, can be followed by serial X-rays with an accuracy which is possessed by no other method. Radiography in the diagnosis of chest disease has now emerged triumphant from some twenty-five years of trial. No one can say what the next twenty-five years may bring forth, but radiography may well become not only the chief agent in case finding but also a great protecting force, a watchman, so to speak, over the chests of multitudes when large non-tuberculous populations are again built up.

If and when the day of such populations arrives, present evidence suggests that another watchman—tuberculin—will be of great value. The fall in tuberculosis mortality in the past twenty-five years inevitably means that increasing numbers of the population reach adult life without previous infection. In Radnorshire, for instance, Jones Davies has shown that only 15.8 per cent. of children at the school-leaving age give a positive skin reaction, and of elementary school children of all ages only 6.5 per cent. reacted positively. The percentage in town dwellers is of course considerably higher, but the Radnorshire figures are a pointer towards a situation which is gradually developing.

Since active disease can only develop amongst the infected groups, it will become increasingly important to watch the reactors radiographically and retest the non-reactors from time to time in an effort to detect the stage when the primarily infected individual passes to the stage of re-infection or active disease.

In conclusion, it must be restated that apart from the evidence of a positive sputum test, there is no single symptom, sign, or other manifestation which is conclusive in itself, and an accurate diagnosis of early tuberculosis can only be reached by careful sorting of the many strands of evidence which make up the fabric as a whole.

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TUBERCULOSIS IN CHILDHOOD

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TERMINOLOGY

“CHILDHOOD TUBERCULOSIS” is not a particular form of tuberculosis differing from other types and occurring only in children, it is a term that might well be dropped. Tuberculous infection may be *primary*, and this usually occurs in childhood, but primary infection may occur in adults at any age, it is the result of the first infection of the body with tubercle bacilli. Any subsequent attack is called *reinfection* tuberculosis and this may be *endogenous*, due to a flare-up of a previous lesion which had become quiescent, or *exogenous*, due to a further infection from without.

The primary lesion may heal completely—usually by calcification—or may continue to spread and lead to hæmatogenous dissemination with tubercle bacilli becoming lodged in various distant parts of the body, such as the meninges, joints or kidneys. If this dissemination occurs shortly after the initial infection it is often called *post-primary* infection. If it occurs after a longer interval, it conforms to the ordinary reinfection type.

The reaction of the tissues at the site of the first infection is called the *primary focus*—in the case of the lung this is the *Ghon's focus*—and together with the associated lymphangitis and lymphadenitis constitutes the *primary complex*. A heavy initial infection may produce multiple such foci.

Primary tuberculosis may be intrathoracic—in something over 90 per cent. of cases—or extrathoracic, either in the bowel, tonsils or, rarely, the skin or eyes.

PRIMARY INTRATHORACIC TUBERCULOSIS

The different manifestations of primary intrathoracic tuberculosis which may occur are—

- (1) The primary complex
- (2) A diffuse infiltration of the lung parenchyma resulting in a tuberculous broncho-pneumonia
- (3) Hilum tuberculosis
- (4) Pleurisy, usually with effusion
- (5) Atelectasis—collapse of a lobe or portion of lung by erosion of a bronchus and occlusion of the lumen, or by pressure from without due to glandular enlargement

DIAGNOSIS—Primary intrathoracic tuberculosis in infancy and childhood is nearly always due to inhalation of bacilli, either by direct droplet spread from an adult in the household, most often a parent with an open tuberculous lesion and positive sputum, or from the inhalation of infected dried dust from floors or carpets, which will harbour tubercle bacilli for many weeks. A history of such contact is valuable when forthcoming.

The *symptomatology* is extremely vague. At the outset there is moderate fever—"the initial fever of infection"—which usually passes unnoticed or is thought to be due to a non-specific intercurrent infection. Abdominal pain is sometimes a prominent feature, and general lassitude and failure to gain weight may be noticed by the parents.

In the case of a primary complex only, there are often no symptoms. In the cases showing diffuse lung infiltration the symptoms are indistinguishable from those of an ordinary broncho-pneumonia. In hilum tuberculosis the characteristic brassy cough associated with enlarged mediastinal glands may attract attention. Children with pleural effusion are usually pale, look ill, run a more marked febrile course and may have an irritating cough. Pain is not pronounced but they easily become short of breath on exertion. Atelectasis is frequently quite symptomless.

It is important to realize that night-sweats, cough and rapid weight loss are *not* symptoms of primary tuberculosis.

Physical examination reveals nothing abnormal in the vast majority of patients with a primary complex. In children with a parenchymal infiltration the signs are those of broncho-pneumonia which cannot be differentiated clinically from other types of broncho-pneumonia. In hilum tuberculosis, if the glands are really large they may give rise to physical signs: impaired percussion note between the scapulæ and whispering pectoriloquy as far down as the fourth dorsal vertebra. Pleural effusion presents the typical signs of impaired movement and dullness at the affected base, absent vocal fremitus, and either bronchial breathing or absent breath-sounds, more usually the former occurs in young children. Atelectasis may cause an impaired note if the area is large enough, and the breath-sounds over it are bronchial in character.

X-rays give valuable help in diagnosis in a certain number of cases, but X-rays alone will make the diagnosis definite in only a small percentage. For example, Sweaney (1941) found that not more than 20 per cent. of primary complexes were radiologically demonstrable, the remainder being obscured by the heart or hidden below the shadow cast by the diaphragm, or were not of sufficient density to show it all. Calcification in the parenchyma is usually evidence of tuberculosis, particularly if there is also calcification in the hila, for it is characteristic of the primary complex to be more evident radiologically in the hilum than in the lung tissue. When there is clear X-ray evidence of a parenchymal lesion the prognosis is less satisfactory. Brailey (1936) found the mortality in the first year after infection to be six times as great in those children who presented a clear-cut picture at the time of their first examination. Without calcification there is nothing pathognomonic about the X-ray picture in parenchymal infiltration, hilum tuberculosis, pleural effusion or atelectasis, for broncho-pneumonia may be non-tuberculous and enlarged hilar glands may occur in whooping-cough and other conditions, pleural effusion and atelectasis too may both be non-tuberculous in origin. Any abnormal pulmonary X-ray shadow, however, *which persists* is highly suggestive of tuberculosis.

TUBERCULIN TESTS—Thus far the history, symptoms, physical examination and X-rays have been considered as diagnostic aids and it has been shown that in the majority of cases of primary tuberculosis they are of comparatively little value.

It is by the result of the tuberculin test that the diagnosis stands or falls Several techniques have been employed—subcutaneous, cutaneous, percutaneous and intracutaneous. Of these the Mantoux intradermal test and the Vollmer patch test have aroused the most interest and have been most widely used. Because of the uncertainty of the latter and the ease with which small children can pull the patch off, the Mantoux is recommended as the best for routine use.

The Mantoux test—Although Mantoux introduced his test as long ago as 1908 it was not used to any extent in this country until more than twenty years later. Since then its use has become routine in most children's hospitals and amongst paediatricians, but its value is still not sufficiently appreciated by practitioners in general, to whom it offers the most valuable aid in the diagnosis of early tuberculosis that yet exists. Judging by the number of children sent to the out-patients' departments at children's hospitals because of the practitioner's and parents' anxiety as to the existence of tuberculous infection, it is clear that it would be of great advantage to the family practitioner to do this simple test himself and set both his and the parents' minds at rest forthwith.

The technique is easy and the injection painless to infants and to the majority of children. Once the limitations of the test are known it may be stated with confidence that a negative reaction rules out the possibility of tuberculosis.

What are these limitations? First, the injection must be truly intradermal; proficiency in technique is rapidly acquired. Unpleasant reactions, either local or general, are most unlikely in young children unless some of the tuberculin has been injected subcutaneously in error. Secondly, skin sensitivity may be depressed during febrile states—in particular, measles, whooping-cough and pneumonia—and a negative reaction may occur under such conditions when tuberculosis is present. It is therefore wiser to perform the test during an afebrile period if possible. Thirdly, in an overwhelming infection, such as miliary tuberculosis or meningitis, a negative reaction is likely. Fourthly, during the incubation period of tuberculosis before allergy is developed the reaction will be negative. Fifthly, a positive reaction may be delayed for a week or ten days. This is rare and usually occurs in the severer types of infection, so that children thus reacting are likely to be in hospital, where the reaction is less liable to be overlooked than it would be were it performed in a clinic or surgery and the child brought up after the customary seventy-two hour's interval for the result of the test to be read. And, lastly, it has recently been reported by Levine (1941) that a number of babies showed X-ray evidence of a primary complex before the Mantoux test became positive. He reported sixteen cases, all in young infants (mostly under four months old), and his findings suggest that in any infant with an otherwise unexplained abnormal lung shadow and a negative Mantoux reaction the test should be repeated.

As regards *dosage*, a 1 in 1,000 dilution of old tuberculin, 0.1 c.c.m. (i.e., 1/10 mgm. old tuberculin) is a satisfactory routine and can be used with safety. It is wiser, however, to use a 1 in 10,000 solution for cases of erythema nodosum and phlyctenular conjunctivitis, patients with these conditions are hypersensitive to tuberculin.

The reaction, as has been said, is customarily read after seventy-two hours, but a positive result is visible for three weeks or longer. Occasionally there is a pseudo-

reaction after twenty-four or forty-eight hours which rapidly subsides, so that allowing seventy-two hours to elapse before reading the result will avoid confusion in such cases. The pseudo-reactions do not leave any pigmentation of the skin as do the true positives. As the size of the reaction bears no relation to the extent or activity of the lesion there is no point in measuring it. Human and bovine infections react alike to both types of tuberculin, so the use of human old tuberculin alone is adequate for normal routine.

A negative reaction denotes freedom from infection with something like 96 per cent. accuracy. If any doubt still exists (e.g., if the test has been performed during a febrile period) the test may be repeated after seventy-two hours using a 1 in 100 solution and, if still negative, again after a similar interval with a 1 in 10 solution. If this last is also negative, tuberculosis may certainly be excluded.

The only failures likely to be encountered are in moribund children who die before the series of increasing strengths of tuberculin can be completed.

The ability thus to be able to diagnose the absence of tuberculosis in a child is a great asset to any practitioner and may take a considerable weight off parents' minds.

THE BLOOD SEDIMENTATION RATE is another simple test of value in assessing the activity of a lesion, particularly if performed serially (e.g., at weekly or fortnightly intervals) and due allowance made for intercurrent infection which might account for a raised rate. For older children the ordinary method of Westergren is satisfactory, but for infants the micro-method described by Trought (1942) is helpful, as it involves only a finger-prick to yield 0.3 c.c. of blood. Like the Mantoux test, in which a negative reaction is of more definite value than a positive, a normal sedimentation rate excludes active tuberculosis, whilst a raised reading may be due to a number of conditions, tuberculous and non-tuberculous. Given a positive Mantoux reaction, an X-ray lung shadow suggestive of tuberculosis, and a raised sedimentation rate, it may be assumed that there is an active lesion and weekly or fortnightly estimations of the sedimentation rate will give an indication of the progress of the infection and act as a guide as to when some physical exercise may be allowed.

GASTRIC LAVAGE—Children spit but seldom expectorate and expectoration rarely contains tubercle bacilli. In the presence of an open lesion the bacilli are swallowed and may be recovered from the stomach by lavage, but this usually necessitates hospitalization and involves guinea-pig inoculation.

With the tests outlined above it is now possible to answer the two most important practical questions—(1) Has a child tuberculosis, either primary or reinfection? (for it is often impossible to differentiate clinically) and (2) if he has, is it active or inactive?

Whereas primary tuberculosis in childhood is relatively benign, seeing that some 40 per cent. of all children have become infected by the time they are fourteen years of age, and most of them pass through it with no ill-effects—and indeed, it is often unnoticed—it needs but a few moments' thought to realize that tuberculous meningitis, arthritis and cervical adenitis all result from a primary infection which has progressed. The primary lesion cannot therefore be lightly dismissed as of no great importance. It is impossible to tell in advance what the effects of this first

infection will be in any given child, it may be benign and heal completely, or it may rapidly progress to a fatal meningitis.

What is the effect of a healed primary lesion? It may be an asset or a liability. No permanent immunity can develop to tuberculosis but evidence suggests that partial immunity can occur, and that it can be overcome by a virulent infecting dose or by an infection with a great number of bacilli. A moderate degree of allergy is probably an asset, and a high degree a liability.

The death rate in tuberculosis is highest under two years of age, either because infants show a lower power of resistance or because at this age massive and repeated infections are liable to occur from a parent with an open lesion.

TUBERCULOUS MENINGITIS

The clinical picture of a fully developed meningitis is well known, as are the characteristic cerebrospinal fluid changes. What is often not realized is the short time which may elapse between the primary infection and the development of meningitis. Wallgren (1941) has shown that in over 60 per cent of cases it was less than two months. It is therefore not surprising that malnourishment is not a feature and that sometimes the meningitis is the first indication of tuberculosis. Often, particularly in infancy, the X-rays do not show any abnormality in the chest—not even a primary focus—and the typical "snowstorm lung" of miliary tuberculosis is not common until later in childhood.

Most of these cases come from homes where there is an adult with an open lesion, but casual contact can occur, and in searching for the source of infection it is necessary to look back about four months six to eight weeks for the incubation period and six to ten weeks for the development of the meningitis. It is known that repeated exposure during the initial period after infection, as would occur in such houses, is prone to produce severe reactions and liability to hæmatogenous spread. For this reason it is essential to remove a child from such contact promptly if meningitis is to be appreciably lessened in the age-period when its incidence is maximal (nine months to two years), difficult though it admittedly is to find suitable accommodation for children of this age.

Although the figure doubtless varies in different areas, it may be assumed that in tuberculous meningitis something over 75 per cent of cases are due to human infection. The incidence of bovine infection has decreased considerably since greater care has been taken to ensure a purer milk supply, and universal pasteurization would still further reduce it.

From the paediatric point of view it would be an ideal procedure for every family practitioner to do routine Mantoux tests on all children under two years of age in his care. At this age any positive reaction would surely indicate active disease and lead not only to the institution of proper treatment but also to the discovery of the infecting parent or relative.

The tuberculin could be provided free by the County Tuberculosis Authority and replenished every three months, a 25 c.c.m. rubber-capped bottle keeps quite satisfactorily at ordinary temperatures for that length of time, the loss of potency being immaterial in a 1 in 1,000 solution.

There is one important practical point to remember: tuberculin is both glass-tenacious and heat-stable, boiling a syringe will not rid it entirely of tuberculin. A special syringe should therefore always be kept for it.

There is abundant evidence of the value of removing positive reactors from contact. For example Hawes (1938) has recently reported a follow-up of 1,400 Mantoux-positive children, 700 of whom had been treated in a preventorium and 700 left at home under ordinary medical supervision. Of the former, one had died and three developed clinical tuberculosis, of the latter, ten had died and forty developed tuberculosis. Similarly Johnston *et al.* (1940) broke the contact of 818 tuberculin-positive children by boarding them out in foster homes and found a reinfection rate of less than 3 per cent.

The need for some such accommodation in this country is urgent, sanatoria are *not* suitable for these children, who are non-infective and should be as far away as possible from any contact with open tuberculosis.

OTHER SITES OF PRIMARY INFECTION

Whilst the tonsils are not infrequently the site of primary infection and the skin and eyes rarely so, the only other important extrathoracic focus is in the bowel, usually in the ileum. The lesion is most marked in the mesenteric lymph glands draining this region and it is important because of its association with tuberculous meningitis, which has been recorded in a number of cases (Engel, *et al.*, 1938). The differential diagnosis is from appendicitis and pyelitis *acutely*, and from chronic intestinal indigestion, rickets and coeliac disease *chronically*. The cardinal diagnostic feature is once again the Mantoux test. Unless the clinical condition is so acute and serious that laparotomy dare not be foregone, confirmation of the diagnosis may be delayed for a year or more until the characteristic calcified mesenteric gland becomes radiologically visible.

OTHER TUBERCULOUS LESIONS IN CHILDHOOD

The diagnosis of reinfection tuberculosis with spread, either to the cervical glands, kidneys or joints, is dependent in the early stages on the tuberculin test and it is in such conditions that the test attains its greatest usefulness. It is as important to orthopaedic surgeons as it is to tuberculosis officers, and many a child with a limp or swollen joint can be spared months of immobilization in plaster by its timely use.

PROPHYLAXIS

There are two possible methods of prophylaxis against tuberculosis in childhood, the first is prevention of exposure, and the second, artificial immunization with BCG vaccine. The first is obviously the more desirable method but the second might be used with advantage when contact with open tuberculosis cannot be terminated. The time is doubtless coming when its more extensive use in this country will give a better idea of its value to the childhood community in general.

TREATMENT

Although in most cases the treatment of tuberculosis will not be undertaken by the family practitioner, a brief general outline may not be out of place.

In primary tuberculosis the first essential is *rest*, until the sedimentation rate becomes normal. In the early stages this will mean bed rest. Fresh air in abundance is an important part of the treatment, and limited exposure to sunlight, or ultra-violet light in small doses, with the chest covered, may be given under strict medical supervision. No special diet is indicated but excessive fat should be avoided. Calcium by mouth, as the gluconate in doses of from 5 to 10 grains thrice daily, vitamin C, 100 mgm., and vitamin D in concentrated form, 500 to 750 International Units daily, may be prescribed, and ferrous sulphate in doses of 10 to 30 grains a day according to age, if anæmia be present. Patients who have progressed beyond the primary stage will require treatment appropriate to their lesions, e.g., bone and joint infections in special open-air orthopædic hospitals, lungs, if with open lesions, in sanatoria or, if there is any doubt as to infectivity, isolated in preventoria.

Specific treatment with gold or tuberculin is rarely indicated in childhood, thoracoplasty, artificial pneumothorax and surgical treatment in general will come within the province of the surgical specialist only.

CONCLUSIONS

In all forms of tuberculosis in childhood the Mantoux test is the most valuable diagnostic aid. It can, and should, be performed by all practitioners, and no child, unless moribund, should be diagnosed as suffering from tuberculosis who reacts negatively.

Routine testing by each family practitioner of all infants under the age of two years in his care would go far towards lessening the incidence of that most fatal disease of infancy, tuberculous meningitis.

An urgent need is the establishment of preventoria where children with primary tuberculosis may be watched and treated for periods from three to six months or longer, where they may have adequate nursing, diet and fresh air and, in the case of older children, educational facilities also.

It should be realized that in the vast majority of cases primary tuberculosis is not infective, and children suffering from it should be kept away from the possibility of any contact with cases of open tuberculosis during the period immediately following their initial infection.

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THE SCOPE OF SURGERY IN PULMONARY TUBERCULOSIS

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IN any discussion on the rôle of surgery in pulmonary tuberculosis there are two fundamental points which have to be taken into account. The first consideration is that only a comparatively small group out of the whole mass of the tuberculous population ever becomes eligible for surgery; and the second depends on the realization that surgery is only incidental in the general scope of treatment and is subordinate to the dictates of sanatorium control. It is essentially a complementary measure rather than a supplementary one, but the results obtained are steadily drawing attention to the necessity of surgery in establishing control of the disease. Earlier diagnosis and the claims of early treatment will inevitably have to be followed by a steady increase in the volume of surgery required. The existing framework of the tuberculosis organization has not allowed a uniform practice of surgery throughout the country and there are many areas in which this form of treatment has yet to make its appearance. There is no doubt that the inclusion of surgery in treatment as a whole has a most stimulating effect on institutions in which it is practised, apart from the collateral developments of other departments, such as radiology and pathology. In short, there are many unexpected virtues in surgery which can be advantageously exploited so long as the position is realized and not allowed to pass out of control as a result of excessive enthusiasm. Once the general principles and place of surgery are recognized, a more direct study of its aims can be enunciated.

COLLAPSE THERAPY

This term covers most of the existing operative procedures, the aim of which is to allow natural retraction of elastic and fibrous tissue. This contraction or relaxation should, from the ideal point of view, affect only the diseased areas (selective collapse), so that by immobilization and mechanical reduction in size the tuberculous process would be placed under the optimum conditions for healing.

In the treatment of any pulmonary tuberculous process, rest and immobilization are required to allow the defence mechanisms of the body to deal with the initial phases of the disease. Bed rest forms the basis of treatment at this stage, and not until any favourable reaction develops and the lesions show a tendency towards healing can collapse measures be contemplated. Cavity formation and fibrotic contractures within lung tissue constitute definite indications for surgery, subject to certain obvious provisos. First, any operation prospected can only be used if the risk of further activation or "flaring" of the tuberculous process is reduced to a minimum, in other words, when the patient has been observed for a sufficient

artificial pneumothoraces which are not frankly contra-selective are thorascoped and adhesions freed whenever possible. The actual division of adhesions by cautery is undertaken when cords, bands and sheets can be severed without injury to lung tissue or chest-wall vessels. The extent of the operation depends largely on the judgement of the individual surgeon. The operation is now performed within a short time of the artificial pneumothorax induction, and it is a procedure of great value and safety which should be undertaken in all cases in which there is any possibility of improving the existing collapse.

PHRENICECTOMY

Phrenicectomy has the virtue of being the most simple and uncomplicated of all operations. Temporary paralysis of the hemidiaphragm for four to six months by crushing the nerve is now preferred in most cases to the irrevocable avulsion. Repeat of the crush can be undertaken if the original effect is not sufficiently prolonged, but the extent of the diaphragm elevation is often disappointing on the second attempt at paralysis.

The *indications* for phrenicectomy are numerous and practically all regard the operation as a small supplementary procedure. Occasionally a case which requires a minimal amount of collapse to help the relaxation of a small healing lesion is subjected to a phrenic crush, in preference to an artificial pneumothorax, the hazards of which over three or more years are much greater. As a preliminary operation a crush can be used in conjunction with rigid bed rest in an attempt to "cool down" a lesion that is not ready to be dealt with more radically, say by thoracoplasty. An artificial pneumothorax which is not completely effective is often helped by the addition of a diaphragm rise, and in any case at the termination of an artificial pneumothorax, voluntarily or because of an obliterative pleurisy, the question of a permanent phrenic paralysis should be seriously considered. Later fibrotic pulls on the lung tissue and chest wall or mediastinum are thus minimized and in this rôle the operation is of real importance, particularly if there was much loss of lung tissue at the time of artificial pneumothorax induction. When basal lesions require treatment the effect of a phrenicectomy is more marked over the lower zone than it would be at the apex, and in a few cases it may suffice alone, although more usually some other procedure has to be used as well.

The numbers of patients submitted to phrenicectomy in proportion to the total volume of work have undoubtedly been reduced in recent years. It was used too optimistically, but in spite of this its value as a "little something more" in the way of relaxation cannot be ignored.

PNEUMOPERITONEUM

This procedure consists of injecting air into the peritoneal cavity after the manner of an artificial pneumothorax, but using much bigger refills (1,000-2,000 c cm.) The effect of this is to force the diaphragm high up into the chest and virtually compress the lung from below. A similar beneficial condition is often seen in the later stages of pregnancy when the bulk of the enlarging uterus helps the resolution

of some tuberculous lesions by holding the diaphragm at a higher level. The actual elevation can be greatly increased by adding a phrenic crush, when the hemidiaphragm may show an extraordinary degree of ascent into the chest.

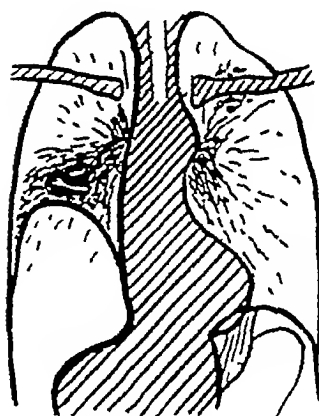


FIG 2
Pneumoperitoneum with right
phrenectomy

The use of pneumoperitoneum in this country is a comparative innovation and the results have not yet been fully assessed, but the degree of collapse by the combined phrenic crush and pneumoperitoneum is so marked that the inclusion of the operation as a routine measure seems fairly assured. Patients find little inconvenience from their inflated abdomens and, as the refills are given into a normal serous cavity and not one in direct contact with diseased lung, the risk of peritonitis is small (unless trauma occurs during refills).

The *indications* are broad and include most of the phrenic crush class, plus a large number of upper-lobe lesions in which thoracoplasty or some selective operation is at the time impracticable. It can only be stressed again that the experimental stage is not yet passed.

THORACOPLASTY

As the ideal form of localized and permanent collapse, thoracoplasty is steadily gaining in favour. The modern operation is essentially selective and consists of excision of the upper six or seven ribs with an apicolysis which allows concentric retraction of the whole of the upper lobe. It should be emphasized that there is practically no deformity. The operation is usually staged and its actual extent depends on the amount of relaxation aimed at. The original form of total operation which amounted to a complete "fillet" of one side is now only rarely used for parenchymatous lesions.

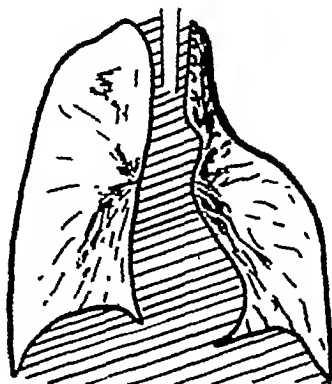
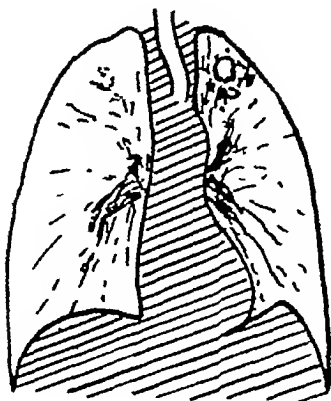


FIG 3
Partial thoracoplasty

The operation is not free from the risk of complications which may arise from infection of the wound or dead space or from massive collapse of the lower lobe. There is also the danger of "flaring up" the tuberculous process in other parts of the lung fields and, as this latter activation results from operating when the disease is not sufficiently quiescent, the selection of the suitable case must be carefully made. It is essential to make sure, so far as possible, that the affected area is stabilized before embarking on this form of surgery. Ideally a fibro-cavernous lesion in one upper zone is the choice, but a certain degree of latitude has to be taken with minimal disease in other parts of the lungs.

It is usually assumed that intrapleural collapse will have failed before thoracoplasty is considered, but there is a growing tendency with some unilateral stabilizing and cavitied lesions to hold off more simple forms of collapse, such as artificial pneumothorax, and keep to bed rest until the patient is ready for selective thoracoplasty. If this is done, a permanent control of the diseased area is obtained without having to wait several years to see if an artificial pneumothorax, for example, has succeeded. The opportunities for this course are naturally limited, but it is noticeable that patients in surgically equipped sanatoria frequently ask if there is any possibility of their having a thoracoplasty in preference to any other form of treatment. The patient is no mean critic.

EXTRAPLEURAL PNEUMOTHORAX

Extrapleural pneumothorax is an operation which bridged the gap between the old-fashioned and new forms of thoracoplasty. It consists in setting the apex of the lung free over a wide area by blunt dissection after resection of a short length of rib. The plane of the dissection is in the layer of the endothoracic fascia and it is essential that the pleural layers should be adherent. The space formed is then

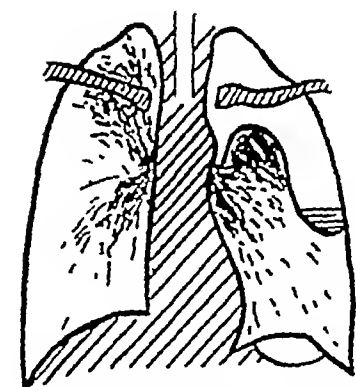


FIG. 4
Left extrapleural pneumothorax

filled with air and treated with regular refills at a higher pressure than in an ordinary artificial pneumothorax. The eclipse of the popularity of the operation partly resulted from the uncontrollable factor of tuberculous infection of the dead space. Too rapid expansion of lung in spite of high-pressure refills sometimes terminated the collapse long before it was intended. Another significant reason lay in the more satisfactory results which could be obtained from partial thoracoplasty in similar cases.

However, in spite of the criticisms offered, extrapleural pneumothorax has a certain value in treating cavitied apical cases which are clearly unsafe for thoracoplasty and in which artificial pneumothorax has failed. There is also a group of cases with bilateral unstable apical disease which can be treated on one or both sides by an extrapleural operation when rib resection seems impracticable and other forms of treatment have failed. The use of wax "plombage" to maintain extrapleural collapse has virtually been abandoned.

be confirmed by some additional collapse operation. In other words, a thoracoplasty has usually to be used to close the cavity after drainage has obtained its maximum benefit. Even if the cavity is closed by drainage the possibility of its re-opening at a later date cannot be ignored.

There is a distinct possibility that a closer study of the end-results of many operations will show that cavities still persist unhealed in collapsed lung tissue. This is noticeable after thoracoplasty and, if the original cavity is of appreciable size and is not likely to be completely obliterated by rib resection, preliminary drainage is well worth considering. Recently, resection of the anterior parts of the upper two or three ribs has been used as a "test" operation to observe the effect on the underlying cavity. If there is a reduction in size it seems probable that collapse therapy will prove successful in closing the cavity, and to this end posterior thoracoplasty is proceeded with. On the other hand, if the cavity remains constant in size, it is drained through the sealed-off operation space so that a leak-valve is formed while further rib resection is in progress.

Allied procedures, such as open drainage with or without the use of muscle grafts, have a limited field of action, but can occasionally be used to supplement thoracoplasty which has failed in attaining its full aim. Cavities at the apex of the lower lobe, which are often loosely referred to as mid-zone cavities, are invariably examples of distension cavities which respond on the whole better to drainage than to collapse.

Many and various attempts, other than those already mentioned, have been made to deal with the mechanical problems set by ulcerating or healing lung tissues. The artificial production of atelectasis by blocking of a bronchus is one procedure that could be instanced. The aim of the operation is to produce cavity collapse along with the development of an airless condition in the lobe, the effect being obtained by obstructing the air-tube with a balloon or non-return valve. An artificial pneumothorax is essential to avoid the effects of sudden atelectasis but, possibly owing to minor technical details, successful results are uncommon.

A description of individual operations involved in the selection and timing of sanatorium measures subordinate to the scope of surgical limitations on the scope of surgery on an individual whose tissues being the process is to court disaster, the quality has developed in the past can be used. With the affect of stabilization and rehabilitation

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CAVITY DRAINAGE

So far all the operations discussed have been based on the principle of collapse, but recent and somewhat belated studies of the pathology and mechanics of tuberculous cavities have shown that the factor of distension enters into their formation in many instances. In other words, cavities may be blown up and during this process lung tissue in the walls of the cavity becomes compressed and atelectatic. If the internal pressure can be relieved, this compressed lung tissue can re-expand and the cavity will become smaller; and if continuous suction is added to drainage it may even lead to obliteration of the cavity. The whole practical concept of drainage has been held up by too rigid adherence to the principle of keeping tuberculous lesions closed and away from the knife or needle.

The operation of closed suction drainage of cavities (Monaldi) consists of introducing a fine trocar and cannula through the fused pleural layers and lung tissue into the cavity. A fine catheter which is later attached to a continuous

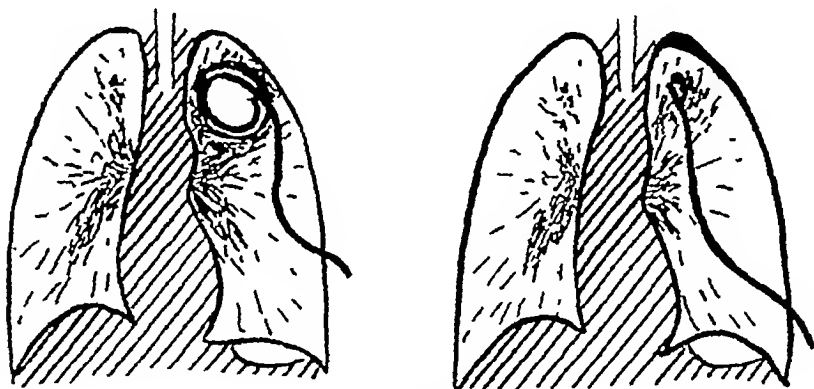


FIG 5
Cavity drainage

suction motor is then coiled into the cavity, where it may remain for months. The site for drainage is usually in the first interspace just below the clavicle, posterior drainage is not as a rule advisable, as the sinus may interfere with a later thoracoplasty.

The place of this procedure has been fairly well established in the treatment of large-sized cavities. The risks are minimal and some of the results are more than gratifying. The best indication consists of a large distension cavity of recent formation without too much surrounding infiltration, but there are many other possibilities in vomicae which cannot be treated because of their size or because of the activity of the parenchymatous lesions. A proportion of this latter group after drainage become eligible for more complete control, and there is undoubtedly benefit to be derived from the external removal of secretions which would otherwise give symptomatic evidence in cough and sputum. However, if cavity drainage is to be used to give more than symptomatic relief, its complete success can only

PSYCHOLOGICAL STRESSES IN INDUSTRY

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STRESSES in industry are responsible for an increasing amount of invalidism as will be readily admitted by any medical man practising in an industrial area. Many of these stresses are ineradicable—for example, the ever-present menace of roof-falls in pits—but many could be lessened by a careful study of working conditions within the factory. In this article an outline of some of these avoidable stresses has been sketched in the hope that to those practitioners who have had no time or opportunity to learn the conditions of factory life in their district, it will serve as a guide for inquiry in cases of workers who break down under industrial strain—or who claim to do so.

GENERAL CONSIDERATIONS

Before proceeding to discuss these stress symptoms, all or most of which are of psychogenic origin, there are one or two general observations to which attention might be drawn. First, emphasis must be laid on a statement, made often enough but equally often disregarded in fact, namely, that *there cannot be any physical disorder without some simultaneous psychological disorder*. The human being is an integrated whole, and disturbance of any constituents affects the whole. To take a homely example—

A corn on the foot is a physical disorder of a local part, but it produces pain—a mental or psychological correlate—and the pain may be sufficient to determine an altered attitude on standing, or gait in walking. If prolonged, this altered motor activity may itself produce further physical and psychological changes.

The indissolubility of the physical and psychological components of the whole human being cannot be too strongly emphasized. It is equally true that there is no psychological illness without some physical disorder; although this may not be so easily demonstrated. It is only quite recently that this side of the psychopsychological equation has been thought worthy of consideration. Like all new ideas it was at first fiercely combated and denied, then given an exaggerated value, but is now beginning to settle down into a reasonable corpus of opinion.

This article is mainly concerned with the psychological aspect of the above equation expressed in an altered personality, as the result of industrial stresses, either accident or illness, and shown by a changed behaviour pattern in the individual.

One other general observation should be made before considering the subject in detail, and that is to the effect that malingering is rare. In a professional life of now almost forty years the number of cases of true malingering I have met can be counted on the fingers of two hands. By malingering is meant the

dryness But such conditions are procurable in rest rooms if not in the shop, and with suitable break-periods in such rooms some of the ill-effects of bad ventilation could be overcome

FATIGUE—This raises the important question of the influence of fatigue on the number of hours worked This aspect of industrial health has perhaps received more attention than any other, since it is the most obvious factor in diminishing output and has consequently caught the attention of industrialists themselves From the disgraceful and truly barbarous conditions of the early nineteenth century, industry has moved, but until recently only slowly Beginning with Robert Owen's efforts in 1800, nineteen hours have been reduced to twelve hours, and twelve to ten and, finally, to eight, and generally in most industrial concerns the number of hours worked per week is now about fifty—excluding the present war conditions Not only has this reduction in number of hours worked been of benefit to the workers, but it has definitely and directly benefited employers by increasing output

Equally important with reduction of working hours, from the point of view of preventing fatigue, is the introduction of *rest pauses* into the working day—though the length of these pauses and their number varies within wide limits For instance, in some of the heavy industries a rest of ten minutes is taken in morning and afternoon shifts in addition to a breakfast-break of fifteen minutes and dinner-break of thirty minutes, whilst in trades such as bootmaking, in which rapidly repetitive work is being done, a rest of ten minutes in every hour has been found to help the workers and increase their efficiency

Besides overwork as a source of fatigue, another factor of extreme importance is *boredom* Repetitive, uninteresting work is at times productive of so much boredom that a worker may be driven to a state of complete nervous breakdown, but here the temperament of the individual must be taken into account The rather slow-thinking, and perhaps retarded, individual may be perfectly happy doing such monotonous repetitive work as requires no thought or concentration, and at times such types of work are welcomed even by the imaginative person, who can do the work without any mental effort whilst allowing his thoughts to be occupied with more interesting things

Generally speaking, however, the deadly soul-destroying monotony of purely repetitive work is a potent factor in mental, and consequently physical, fatigue, with a tendency to nervous irritability, diminished efficiency, and at times outbursts of aggression against workmates or authority

Misfits—The wrongly placed individual becomes a source of irritation to himself and others, and this contributes to the onset of fatigue and nervous illness If he is mentally or physically incapable of doing his allotted job efficiently he may hold up production and so increase the burden on his workmates, and disorganize the atmosphere of all those around him, from the shop-manager to the most newly appointed boy, or be a constant grumbler, complaining of his difficulties, unfair work, and so on

INSECURITY—This is perhaps the most important of all the stresses in industry Many workers, owing to the nature of their work, are dependent for their social and financial security on fluctuations in the industrial markets generally, and this

uncertainty, with the knowledge that their tenure cannot be guaranteed by any effort of their own, no matter how genuine and well-directed, is the most frequent cause of nervous illness. At present it is true that this cause is not operative to the usual extent, and the fatigue of long hours is to some extent offset by the greatly increased earning capacity, but in normal times, and in my experience, the factor of insecurity is the most important cause of psychological illness. As Herbert Morrison said in a broadcast on June 26th, 1943—"Social security is a necessary basis for any social change."

It will be noted that the industrial stresses giving rise to psychological illness have been noted in the inverse order of their importance, i.e. noise, illumination, ventilation, fatigue and insecurity.

PSYCHOLOGICAL SEQUELÆ

As mentioned earlier, there can be no physical illness without psychological correlates, and no psychological disturbance without a physical one. The following remarks deal only with the psychological results of industrial stresses, whether associated with gross physical disabilities or not, and do not cover the question of physical injuries with their resultant mental corollaries, so that only psychoneuroses, or the psychoses are considered.

Everyone is liable to break down mentally, to show a psychotic or psychoneurotic reaction if subjected to a sufficient stimulus, which type of reaction does in fact result, will depend entirely upon the personality, which is itself dependent on two factors—*inherent make-up*, and *early environmental influences*.

Personality is determined during the early years of childhood, so that any psychotaxis (mental upset), whether psychoneurotic or psychotic, may become manifest at any time, say, after the age of seven or eight.

ANXIETY NEUROSIS—Of the numerous clinical pictures presented by patients suffering from industrial stresses (and here is included the army, which is now almost as essentially an industry as any other concern with, however, certain additional stresses) the most common is anxiety neurosis.

Anxiety is a state of mind produced by some environmental circumstance, uncomfortable or unpleasant, or containing some element of danger surrounding an individual. It is a state of mind showing preparedness to deal with a difficult or dangerous situation, not yet sufficiently clear to determine a distinct line of action. In an actual situation of danger where anxiety is felt, once action has been decided upon, anxiety vanishes. Everyone is familiar with the feeling of intense anxiety before a race—a feeling which instantly disappears as soon as the starting gun has been fired.

Psychologically, or perhaps better still biologically, speaking, this feeling of intense mental excitement, commonly called anxiety, is a condition of tension wherein nervous energy is held in check ready for immediate disposal as soon as its direction of disposal can be determined by the individual. It might be compared to a head of steam built up in a boiler ready for immediate release as soon as the engineer determines which valve to open, and meanwhile the pent-up energy may be noticeable in vibration of the whole mechanism, which vibration will cease as soon as the steam is released.

These ulcers, or "desert sores" as they were then termed, were a source of great trouble and inconvenience to the medical officers of all units operating in the dry sandy Libyan desert, and it had long been recognized that vitamin C deficiency combined with the dryness of the climate, was in large part responsible for the condition, it had also been demonstrated that large numbers of such sores were infected with Klebs-Löffler diphtheria bacilli. We explained this last feature to the Italians and were politely told that they knew all about it. Nothing was done to help, however, beyond issuing quantities of ichthyol paste. These sores affected almost everyone and took weeks, in some cases months, to heal, crusts formed almost daily and necessitated much time and labour to effect their removal before applying the paste. Many of the sores healed only after the men had been transferred to Italy.

Malarial cases—A few old infections, so far as we were able to ascertain, caused quite a lot of trouble on sick parades as we rarely had any quinine, or even aspirin (!) to give the sufferers. The poor fellows usually had to lie down and "stew" for a few days until the fever left them.

CONCLUSION

These then were the main conditions with which we had to deal, not in themselves overwhelming, but in view of the limited supplies of drugs allowed us— aspirins, cathartic pills, cough tablets, bismuth and opium and magnesium sulphate, all in very inadequate and irregular quantities—extremely difficult to deal with properly and satisfactorily.

During the later months we fully expected some devastating epidemic to break out amongst so ill-protected and poorly-fed a collection of individuals, and it was a minor miracle to us that no such holocaust took place. There were some eight or nine cases of diphtheria at the end of July, two possible cases of cerebrospinal meningitis, three cases of anterior poliomyelitis, and one case of a cerebral attack of relapsing fever in an officer previously infected in Upper Egypt. All these patients were transferred to hospital after much raising of objection on the part of the Italians, and usually with three or four days' delay before an ambulance could be sent. One most astonishing feature of these crowded camps, where every man was liberally covered with lice of all sorts and sizes, was the absence of any recorded outbreak of typhus, a contingency which we daily expected to meet, and to the tackling of which we gave much anxious consideration.

Lastly, I must mention two cases of appendicitis which developed in the camp. On both occasions no ambulance was forthcoming for three days to remove the men to hospital and they arrived in Tripoli with distended bellies, perforation, followed by the setting-in of acute peritonitis, having taken place either just before or during the fifty-mile journey to hospital. Both men were given large doses of morphine on admission, and died shortly afterwards.

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THE INTERPRETATION OF PHYSICAL SIGNS*

I—PHYSICAL METHODS OF EXAMINATION IN CARDIOLOGY

BY CRIGHTON BRAMWELL, M D, F R C P

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IN cardiology there are four aspects of diagnosis—(1) Structural lesions, (2) disorders of function, (3) the disability, (4) the etiology

It is with the first two of these that the physical methods of examination are chiefly concerned. the degree of the disability is assessed by the patient's capacity to undertake physical exertion, and the etiology of the condition is deduced from the nature of the structural lesions and disorders of function considered in conjunction with the clinical history and the results of certain special tests, such as the Wassermann reaction

STRUCTURAL LESIONS

In the diagnosis of structural lesions and disorders of cardiac function, a number of physical methods are at the disposal of the clinician and his aim should be to employ those which are capable of yielding the most accurate and trustworthy information. The specialist is able to use radiography, electrocardiography and other instrumental methods, but the general practitioner has to rely chiefly on his unaided senses, and from inspection, palpation, percussion and auscultation he can obtain much useful information, provided he recognizes clearly the limitations of these methods

CARDIAC ENLARGEMENT—An enlarged heart is generally a diseased heart, hence evidence of cardiac enlargement is always important. Such evidence is best given by X-ray examination, but, when this method is not available, it is necessary to fall back on palpation and percussion.

The most reliable clinical guide to the left heart border is the *maximal cardiac impulse*. This impulse is produced by the systolic impact of the turgid apex of the left ventricle against the chest wall, but to be of any value in cardiometry it must be a definite thrust which is strictly localized. When the impulse is not palpable with the patient lying on his back, it can sometimes be felt when he turns on his left side. This change of posture usually involves an outward displacement of about 2 cm.

The position of the cardiac impulse in normal subjects varies with the body build of the patient. In adults of average build, it is situated in the fifth intercostal space, slightly internal to the mid-clavicular line, but in people with long narrow chests, the viscera tend to be disposed more vertically and, in them, the maximal impulse may be situated in the sixth space correspondingly closer to the midline. Conversely, in the wide shallow-chested type with a high diaphragm,

* At the special request of a subscriber a short series of articles by experts has been arranged to deal with methods of examination, the eliciting of physical signs and their interpretation, with reference particularly to the problems of general practice

Systolic murmurs at the base of the heart are rarely of pathological significance, and should not be taken to signify aortic stenosis, unless they are harsh in character and are associated either with the diastolic murmur of aortic incompetence or with a slow-rising pulse. A systolic murmur in the pulmonary area is often heard in patients with an overacting heart due to thyrotoxicosis or to other causes. It is believed to be due to a functional pulmonary stenosis produced by compression of the pulmonary artery by the heart against the chest wall. Systolic murmurs due to congenital lesions are usually harsh in character and accompanied by thrills.

Apical systolic murmurs—Some difference of opinion still exists, even amongst cardiologists of repute, regarding the significance of apical systolic murmurs. It is, however, generally agreed that it is wrong to restrict a patient's activities on account of a systolic apical murmur unless there is circumstantial evidence of heart disease, such as cardiac enlargement, impairment of the exercise tolerance, or a recent rheumatic history. I teach my students that an apical systolic murmur is equivalent to the notice "Halt! major road ahead." It is a reminder to look round carefully for other signs of heart disease before proceeding to decide that all is well.

There are many possible causes of so-called "functional" systolic murmurs. The mitral differs from the aortic valve in that defective closure depends most commonly not on the deformity of the valve cusps, but on lack of support from the muscular tissue surrounding the orifice.

Apical systolic murmurs are often heard in patients suffering from anæmia. When, as the result of treatment, the blood picture returns to normal, the systolic murmur usually disappears. The term "hæmic" was formerly applied to these murmurs, on the hypothesis that they were due to an alteration in the viscosity of the blood. It is, however, more probable that they are really a sign of temporary mitral incompetence, resulting from an atonic condition of the myocardium. The fact that such incompetence is curable, places these murmurs in quite a different category from those due to chronic valvular lesions.

Mitral regurgitation may also be the result of dilatation of the mitral ring secondary to dilatation of the cavity of the left ventricle.

A systolic murmur may be produced by the impact of the heart against the lungs, each heart beat giving rise to audible movements of the air in the bronchi. This "cardio-respiratory" murmur can often be recognized by the fact that it varies in intensity, and may even disappear entirely, during certain phases of respiration, but, in some cases, it is audible even while the patient holds his breath.

DISORDERS OF CARDIAC FUNCTION

BLOOD PRESSURE ESTIMATION—Estimation of the blood pressure, especially the diastolic pressure, sometimes presents difficulty. Sphygmomanometry is a rough method, and is only capable of yielding approximate figures. The pressure should therefore be stated as a multiple of 5 mm., to attempt to obtain a more accurate reading is neither scientifically sound nor clinically necessary, whilst in auricular fibrillation, since the pulse beats vary greatly in force, it is only possible to give a figure which represents a rough average of the different beats.

It is an advantage to take the first systolic reading by *palpation*, inflating the

armlet in steps of 10 mm and stopping as soon as the radial pulse disappears. Such a preliminary rough reading can be rapidly obtained; it serves as a check on the subsequent auscultatory reading and obviates the necessity of raising the pressure in the armlet to an unnecessarily high level before starting deflation. Compression of the arm is never pleasant for the patient on account of the congestion produced, but discomfort can be reduced to a minimum if the procedure is carried out expeditiously.

As the armlet is deflated, the sounds heard over the brachial artery change both in quality and intensity. The first sounds to be heard during decompression are a regular series of dull thuds. These constitute the "first phase" arterial sounds. They are succeeded in the "second phase" by sounds which are blurred and have more the character of a murmur. These in turn are followed by the clear loud sounds of the "third phase" which progressively increase in intensity as decompression proceeds, and eventually diminish, at first slowly, then abruptly. The sounds of the "fourth phase" differ from those of the "third," not only in intensity but also in quality, instead of being clear and sharp they are dull and muffled. The "fourth phase" is usually a short one and with a further fall in pressure of only a few millimetres the sounds die away.

The *auscultatory method* of estimating blood pressure depends on the change produced in the form of the pulse wave by the application of pressure to a segment of the brachial artery. As the compressing pressure falls below systolic, the pulse beats distal to the armlet increase in strength and, when the compressing pressure is slightly above diastolic, the pulse acquires a water-hammer character. When the compressing pressure falls below diastolic the water-hammer character is suddenly lost. During the third phase of decompression when the pulse is of the water-hammer type the arterial wall is set into violent vibration and loud sharp sounds are heard on auscultation, but when the pulse resumes its normal form the sounds once more become muffled.

Occasionally the arterial sounds become faint or even die away during the second phase of decompression to reappear after a further fall of 10 or 20 mm. Mistaken readings of the systolic pressure due to this so-called "silent gap" are avoided if an initial reading be taken by palpation.

A difference of opinion exists regarding the stage of deflation of the armlet which represents the diastolic end-point. In the United States it is customary to take the disappearance of the sound (i.e., the transition from fourth to fifth phase), but in Britain most cardiologists agree that the transition from the loud sharp sounds of the third phase to the quieter and duller sounds of the fourth phase is the correct reading. The former is less liable to cause error when the observer is inexperienced, but the latter is physiologically the more correct.

In patients with aortic regurgitation, loud sounds may be audible throughout the whole range of decompression. This renders estimation of the diastolic pressure difficult, the end-point being represented merely by a change in tone without any striking diminution in intensity of the arterial sounds. Conversely, in patients with pure aortic stenosis, the arterial sounds are audible only over a very limited range, which may be no more than 15 or 20 mm. In these circumstances the auscultatory method of estimating the diastolic pressure breaks down, but the systolic pressure can be determined by palpation.

PULSE RHYTHM—The final court of appeal for the cardiac arrhythmias is the electrocardiograph, but the common types of arrhythmia can generally be recognized by palpation of the pulse.

NOTES AND QUERIES

CATARRHAL SINUSITIS

QUESTION—I seem to be seeing many patients with sinus infection with "colds." I am not satisfied with the results of inhalations, and I wonder if there are other means which I can employ? Are sulphonamides of any use?

REPLY—A large proportion of the cases of acute nasal sinusitis following "colds" (acute catarrhal infection) in the autumn are caused by the pneumococcus. Rest in bed in the propped-up position and the administration of sulphapyridine, in addition to the steam inhalation of menthol and benzoin, are usually successful. The middle meati of the nose are painted with a solution of 20 per cent cocaine to which a few drops of adrephrine inhalant has been added. This application, which shrinks the mucosa and allows the escape of mucopus, can be made once a day. Pain is relieved by Tab codcin or Dover's powder and aspirin. If the pain and temperature do not disappear within a week and thick mucopus is seen in the middle meati the sinusitis is often localized to one or both antra. If one or both antra are opaque to transillumination and there is no improvement after a few days of the above treatment the antrum should be punctured with a trocar and washed out with warm boracic lotion.

EDWARD D. DAVIS, F.R.C.S.

TREATMENT OF TAPEWORMS

QUESTION—Can any expert help me about the treatment of tapeworms in a child of five years? I have followed directions regarding filix mas, but have twice failed to get the head.

REPLY (from an expert in tropical medicine)—No preparation can be regarded as infallible. The most effective remedy, sponsored by Mapleson and others, is carbon tetrachloride, with which a cure rate of 75 per cent is claimed. For a child of five, of approximately normal weight, the dose is ten minims. The drug may be given emulsified in skimmed milk or, preferably, shaken up in half an ounce of saturated solution of magnesium sulphate. In the former case a dose of magnesium sulphate should be given two hours after; in the latter, only if necessary, four hours after administration. Mixtures should be prepared immediately before administration and the drug must, of course, be pure. It is usual to give the dose in the early morning after a light supper, but in the case of delicate children it may be preferable to give a light carbohydrate meal some three hours in advance. Afterwards a meal, chiefly carbohydrate, may be given as soon as the bowels are evacuated. Repeat-doses, in case of failure, should not be given until at least fourteen days

have elapsed and, provided that the first dose has been well tolerated, the second dose may be advanced to twelve minims. The drug is usually well tolerated by children, but toxic symptoms, ascribed to idiosyncrasy have been recorded. The following precautions should be observed—

There should be no starvation and the urine should be free from acetone. The child should be in approximately good health. A preliminary diet is given for a few days, rich in carbohydrates, protein and calcium but low in fat. Fat and alcohol are avoided in any form for a few days after treatment.

If there is evidence of a simultaneous *Ascari* infection, this is first treated with hexylresorcinol. Hexylresorcinol has also some action against tapeworms, is of low toxicity but is less effective than carbon tetrachloride. The dose for a child of five is two hard-coated capsules, each of 0.2 gm.

VITAMIN E AND REPRODUCTION

QUESTION—At a recent lecture to the troops on vitamins it was stated that the absence of vitamin E in the diet produced "degeneration of sex organs resulting in sterility and impotence." It was further stated that this vitamin is totally lacking in the food of the majority of people. This statement has caused great alarm and despondency, and there is a strong demand for the supply of watercress and fresh lettuce, which were the only articles of diet mentioned on a printed form as containing vitamin E. Could some expert tell me whether the statement is correct?

REPLY—The two main statements contradict each other. It is notorious that the human race reproduces itself. Further, the poorest groups of the population, whose diet in Great Britain is more devoid of vitamin E than that of any other class, have more children than the rest. It is stated that the poorest twenty-five per cent. of the population produce half of the next generation. The explanation is that the original work on vitamin E is true of the animal used for experimentation—the laboratory rat. It is true that some veterinary surgeons believe vitamin E to be useful in treating repeated abortion, and some gynaecologists say the same of the human race, though others maintain that good advice given to the pregnant woman is as effective as vitamin E. This can hardly be true, though, of the cow. Your reader is, however, encouraged to persist in his demand for watercress and lettuce, but not for the reason given. Watercress is good as a source of vitamins A and C and of calcium and iron—all often deficient in an institutional diet, and lettuce is useful as a source of vitamin A.

V. H. MOTTRAM, M.A.

PRACTICAL NOTES

SULPHAMETHAZINE A CLINICAL STUDY

In order to test the toxicity of sulphamethazine and the incidence and severity of urinary complications, P. O. Hageman, C. G. Harford, S. Sobin and R. E. Ahrens (*Journal of the American Medical Association*, October 9, 1943, 23, 325) have carried out investigations in a series of 103 patients. The series included thirty-seven meningococcal infections, seventeen pneumococcal, fifteen streptococcal and four urinary tract infections, and thirty cases of miscellaneous disease (including gonococcal and taphylococcal infections). No patient had been previously treated for the current illness with any other sulphonamide. The drug was given in initial dosage of 4 gm. (orally when possible) followed by 1 gm. eight-hourly. In severe cases the initial dose was up to 8 gm. with eight-hourly maintenance doses of 2 gm. It was planned to force fluid intake to 3,000 c.cm. in twenty-four hours in order to obtain a urinary output of 1,000 c.cm. or more in twenty-four hours. In some cases this could not be adhered to owing to shortage of hospital personnel. Blood concentrations were measured at least every twenty-four hours, just before the administration of the eight-hourly dose. Urine examination was carried out daily. In the meningococcal group there were five deaths, all elderly patients with complications; in the other cases there was rapid improvement. This group included three pregnant women, all of whom recovered without apparent injury to the fetus. Uniformly good results were obtained in the pneumococcal group, only two patients had bacteraemia. There was one death in this group, a patient with meningitis and bacteraemia. In the streptococcal group there was one death, a patient with complicating diabetes mellitus. The results in the urinary tract infection group were also satisfactory, and there was no incidence of bacteraemia and no deaths. In the group of miscellaneous diseases the results were comparable with those observed with sulphadiazine therapy. The investigation showed that sulphamethazine is rapidly absorbed from the gastrointestinal tract and rather slowly excreted by the kidney. Adequate drug levels could be obtained by eight-hourly maintenance dosage. Tolerance to the drug was good. As regards toxicity and hypersensitivity (drug fever and rashes), the incidence was about the same as observed with other sulphonamide derivatives. Kidney and urinary tract complications occurred

more frequently than was anticipated. Crystalluria without haematuria occurred in 6.8 per cent. of all patients, in all instances the complication was benign. Haematuria occurred in 8.7 per cent. (all but one of these patients had meningococcal meningitis and received large doses of the drug). Post-mortem examination in one case without haematuria or crystalluria showed concentrations of acetyl-sulphamethazine in both ureters. Large amounts of the drug had been administered and the fluid intake had been sub-optimal. In conclusion, the authors state that the results show that less sulphamethazine is needed to procure blood levels comparable with those obtained by the use of other sulphonamides. The fluid intake was unfortunately lower than planned, and this may have had some effect on the urinary complications. But it is of interest to note that each case of haematuria subsided without evidence of embarrassment of kidney function. Taken as a whole, and in view of the fact that the circumstances under which the drug was administered in many cases were such as to offer excellent opportunity for urinary complications, it seems probable that sulphamethazine produces fewer renal complications than sulphathiazole and sulphadiazine.

SLEEP CONTROL IN THE TREATMENT OF MIGRAINE

In an article dealing with the interrelationship of sleep and migraine, M. Gans (*Palestine and Near East Medical Journal*, May-June 1943, 2, 97), on the basis of the theory that in susceptible persons attacks of migraine frequently followed heavy, deep sleep, has instituted a method of sleep control or "sleep diet" with obvious success. Any sleep during the day is strictly prohibited, as a substitute the patient is allowed one or two rest periods of fifteen minutes, sitting comfortably in a chair with closed eyes. At night a separate room is necessary with specially trained personnel. The patient is carefully watched by the nurse at regular intervals, and at the slightest sign of falling into deep sleep (such as unnatural body posture, sinking back of head, snoring), he is touched lightly; whereupon he instantaneously returns to superficial sleep level. If necessary the procedure can be repeated, and if sleep should become too heavy the patient is roused completely. The optimal period of sleep for migraine patients is six-and-a-half hours. Soon after the institution of the sleep diet the patients

NOTES AND PREPARATIONS

NEW PREPARATION

SULPHAMIDO-UREA—It is claimed for this compound of sulphanilamide and urea that by its use sulphonamide inhibitors are counteracted, bacteriostasis is increased and the severity of toxic reactions much reduced. Sulphamido-urea is issued in the form of tablets of 0.5 gm., price 2s and 3s 9d per 50 and 100. The compound will also be available shortly in powder form for use in pyodermatoses and the local treatment of wounds. The manufacturers are the Watford Chemical Co., Ltd., 50 South Audley Street, London, W.1, from whom literature and samples for clinical trial can be obtained on application.

INSULIN COLOUR CODE

As the result of cooperation between the manufacturers of the different insulin preparations (Allen & Hanburys Ltd., Boots Pure Drug Co., Ltd., The British Drug Houses Ltd., and Burroughs Wellcome & Co.) a standardized design for all British-made packings has been agreed upon, thus enabling ready identification of the type and strength of the insulin by means of distinctive colour schemes and the unit strength displayed in bold figures on both label and carton. An explanatory card, printed in colours, can be obtained from any of the manufacturers concerned.

CALFOS LTD DIARY, 1944

A LIMITED supply of pocket diaries for 1944 are available to practitioners on application, enclosing a penny stamp, to Calfos Ltd., Imperial House, 15-19 Kingsway, London, W.C.2.

BOARD OF REGISTRATION OF MEDICAL AUXILIARIES

THE 1943 editions of the Registers of Chiropractors and of Speech Therapists have just been published, and copies can be obtained free by medical practitioners on application to the Acting Secretary, the Board of Registration of Medical Auxiliaries, British Medical Association House, Tavistock Square, London, W.C.1.

THE BRITISH PHARMACOPŒIA, 1932 AMENDMENTS

A NOTICE of amendment to the British Pharmacopœia, 1932, which has been sent to the London, Edinburgh, Belfast and Dublin Gazettes, draws attention to certain changes in and dispensing of formulæ, necessitated by wartime conditions. *Confection of sulphur*—the tincture of orange may be omitted. *Liquid extract of colchicum corm*—in dispensing, the seed may

be used in place of the corm. *Liquid paraffin*—this is the most important from the practitioner point of view, as the other amendments chiefly concern the pharmacist. The American paraffin which is now often employed, is likely to become misty if kept in too cold an atmosphere, it is therefore advised that such liquid paraffin be kept in a warmer atmosphere than heretofore.

OFFICIAL NOTICES

Vitamin and Iron Supplements for Children under 5 in Public Elementary and Nursery Schools (Administrative Memorandum no. 485) draws attention to the facts that cod-liver oil and orange juice are available to all children under the age of five in full-time attendance at public elementary, nursery and other day schools, these allowances being in addition to those obtainable on the children's ration books and not necessitating the surrender of coupons. Ferrous sulphate tablets will also be made available for administration to children under five attending nursery schools, particularly wartime nursery schools. This administration is to be on the advice of the medical officer in charge only, and on the application of the Authority to the Senior Medical Officer of the Ministry of Health the tablets will be supplied in tins of 1,000, free of charge to both authority and parents. See *Education in Schools and Youth Organizations* (Educational Pamphlet no. 119) issued by the Board of Education deals with the important subject of sex education for the elementary school child, through the different stages to the student at the training college. This little pamphlet gives much useful advice concerning the instruction of the innocent, the ignorant and the misinformed. Copies can be obtained from H.M. Stationery Office, price 6d.

CONTENTS FOR FEBRUARY, 1944

DISEASES OF THE EYE

Eyesight and Glasses? By N. Bishop Harman, M.B., F.R.C.S.

Some Diseases of the Eye Met With Abroad. By A. F. MacCallan, C.B.E., M.D., F.R.C.S.

Tuberculosis of the Eye By Professor A. Sorsby, M.D., F.R.C.S.

Contact Lenses By F. A. Williamson-Noble, F.R.C.S.

Orthoptic Treatment By Mary Pugh, M.R.C.S.

The Interpretation of Physical Signs II—Is Lung Disease By M. Davidson, D.M., F.R.C.P.

EYESIGHT . . . AND GLASSES

By N BISHOP HARMAN, M B, F R C S

Consulting Ophthalmic Surgeon, West London Hospital

WHY do we wear glasses? Who is there amongst us who wears glasses all day long, or uses them when doing close work, who would not do anything that might be possible to relieve himself of the necessity of wearing glasses? What a wonderful asset is perfect sight! What a wonder is the ability to see with open eyes all the views in the distance, and also near to, with perfect distinction of detail! What a wonder also, is the power to read the finest print of books and newspapers in these days of inevitable small print! But some of us can only achieve this vision with the aid of glasses, and we find these are an amazing blessing, even though lenses have edges that limit our field of vision, and bridges that mark our noses! Why cannot we adjust our eyes to see with perfection without such aids as spectacles? That is the question put to us by some folk nowadays by the revival of the fantasy of Bates in the curious book of Aldous Huxley

Huxley's ideas can be dismissed at once, in his youth he had a serious bodily disease, and it affected his eyes. The corneæ of his eyes, the watch glasses of the eyes, were spotted all over inside with dots of inflammatory lymph, keratitis punctata. His sight was as is seen when on a frosty morning an attempt is made to look out of the bedroom window. Vision is impaired because the inside of the glass is covered with a haze of fine misty dots of moisture. The window can be wiped clear at once, but it takes years to absorb inflammatory spots from the inside of the cornea. Huxley thinks fantasies absorbed the dots, and did not know it was nature striving to give him health. Sympathy may be expressed with Huxley, but no one should risk following his distorted ideas.

But there are far wider problems than this. We wear plus lenses, minus lenses and lenses that are parts of cylinders. Why do we need these? The answer is —because of the shape of our eyes. Again, it may be asked "is it possible so to alter the shape of our eyes that we can see perfectly without glasses?" The answer is "No."

CAUSES OF DIFFERENT EYE SHAPES

The eyes are wonderful organs. They are set within the hollow cavities of the orbits, within a slippery sheath, and gently padded with fat. There are delicate muscles outside the globes that move them this way and that with amazing accuracy. There is not any real fixation of the eyes to the orbit. The nerve is slack, the conjunctiva is loose, the sling beneath each eye does not hold it. Yet the two eyes work together with surprising accuracy. Perfect eyes, that is, eyes that have perfect focus, are few. The finding of a perfect eye on examination by every test is always of interest. Eyes differ in shape. Most are a little too small from front

to back, and some are a little flattened so that the curvature is not true. Other eyes are too long from front to back. The small eye is commonly called hypermetropic; the oddly shaped eye astigmatic, for it has no focal point near or far. The long eye is myopic. The differences in individuals' eyes are anatomical characters. Most people who have hypermetropia or astigmatism are born with these imperfections. But myopia comes as the child grows up, it is due to some weakness of the white coat of the eye, the sclerotic. After middle age, disability to read without glasses, or presbyopia, is due, not to any change in the shape of the eyes, but to the hardening of the crystalline lenses. The lenses are most elastic and therefore most adjustable by the focusing muscles in youth, but with the increase of age there is a steady increase of the hard nucleus of the lens, so that the power of adjusting its shape is lost, it becomes hard, and relief of the loss of power to adjust the focus of the lenses inside the eyes can only be attained by putting the necessary lenses outside the eyes.

Now comes the question so often asked by some people nowadays—Will any sort of eye exercise improve the condition of the eyes, and really alter their shape, so that eyesight becomes so sharpened that glasses are no longer needed? To get an answer to this question it is needful to understand why the shapes of individuals' eyes differ—why some are born far-sighted and others astigmatic. There appears to be no doubt that eye shape is associated with head shape. It is difficult to prove this in man, for the differences are so small. But if the eyes of other creatures are examined, particularly fishes, it is clear that eye shapes and orbit shapes vary with head shapes.

Fish whose bodies are flat from side to side, sometimes oddly flattened, such as John Dory, show this. One of these, known as *zeus faber*, I examined. Its eye is a discoid bulb, more the shape of a button than a marble. The measure of the eye from side to side was 26 mm. and yet the measure from front to back was no more than 9 mm. Why should these fish have such oddly shaped eyes? The answer is that if they had round spherical bulbs these would obtrude from their bodies and speedily get damaged. That extreme illustration is the indication of the reason for variation in human eyes. There is another illustration that fishes give of a most surprising order. We all know the pleuronectids, the "flat fish," soles, plaice, turbot and so on. These when young swim on an even keel, then ground feeding makes their bodies turn flat to the ground. The bones of the skull are twisted so that the under eye gets to the top surface. So when full grown the fish have two eyes on the top side, which sit up like two small conning towers and look forward together like the eyes of a man. Their eyes most astonishingly can be rotated inwards as much as one-eighth of a circle. All fish have a small slip of muscle called the superior oblique, but in the vast majority it is only a mere straight slip. On dissecting these flat fish I found an astonishing development of this muscle—a lengthy slip of it passed right over the top of the eye-ball, so that it could rotate the eye, just as can the human superior oblique.

So much for the evidence of the linkage of head and eye shape and eye equipment.

Human eyes are nearly perfect spheres—the orbits are so well arranged for bulbous eyes—yet there are imperfections linked with variations of head shapes. There is no rule in this, but there is not any doubt of the connexion with hypermetropia and astigmatism. Short-sight or myopia is not apparently connected with head shape, but is due to a weakness in growth of the main coat of the eye-ball so that the normal inward tension of the eye-ball tends to stretch it, and with stretching there is increasing weakening; thus myopia may be progressive, and dangerous to sight. The fact that head shape and eye shape, seen so grotesquely

n fishes, are to be found in an infinitely delicate fashion in man is in reality the answer to the question "will any sort of exercise benefit our eyes and enable us to do without glasses?" The answer is "NO!" A plain unqualified NO! It is impossible to alter the shape of our heads. We cannot change the shape of our noses. Can anyone by any exercise or fantasy of thought change an ugly snub nose to a delicate straight nose or a bold Wellington nose? If a man has a nose twisted by accident a skilful surgeon by a delicate and clever operation can straighten it. But that is no "exercise" it is surgery. If the error of the eye is gross, eye surgeons dare to operate on occasion, but that is direct action, and no fantasy or exercise.

EYE TRAINING

Myopia—But there is another aspect of exercise. The word in its Latin origin means "to drill, train, to practise, to follow employment." This can be done for eyes which need such treatment. Early in this century investigations were started in London on the eyesight of children in the elementary schools. I published returns of 2,500 London school children who had poor vision. 68 per cent were hypermetropic, and 32 per cent myopic or short-sighted. These defective children represented about 10 per cent. of the school population, thus it followed that some 3 per cent. of the children were myopic. When the cases were plotted down according to the age of the children it was found that there were very few short-sighted children in the younger years, but a steady increase right through the school years to the leaving age. These were the percentages—

Age in years	4	5	6	7	8	9	10	11	12	13	14
Myopic (per cent)	0	2	8	12	20	24	33	40	49	52	65

These figures show well the character of myopia, it comes on during school life, and increases in frequency and in degree with each year of school age. The obvious danger to highly myopic children of normal school work, even with proper correcting glasses, led to the formation of "myope classes", where the children were exercised. They were drilled and trained how to use their eyes to save them. Writing was done on blackboards, and also drawing, and arithmetic, big prints were displayed, manual work was taught as the pivot of thought, and drill, games and dancing given to improve their health. These classes were such a success that they were copied widely, and the Americans called them "Sight Saving Classes"—a good name!

Squint—Can other exercises be used with advantage? Yes, in squint cases. The error of vision is corrected under atropine, glasses are ordered to correct the discomforting error. Sometimes the glasses straighten the squint; if they do not then orthoptic treatment with stereoscopic exercises is carried out with care to try to regain the normal interaction of the disturbed external eye muscles. Some cases respond, others need operation to adjust the muscles to the correct position. But glasses are imperative.

PERSUASION

Exercise is sometimes held to be persuasion. The effect of persuasion is sometimes amazing, but it is always mental. I remember well one of my earliest experiences of this effect.

I was asked to visit a certain well-known school for blind boys, and to report on the conditions and the possible improvement of their eyes. One boy, aged thirteen years, came to me in due course for a preliminary examination. I found no defect in his eyes. Then came the morning interval for the boys, they went into the playground to play football, mostly by shuffling about. I sat behind the window curtain to see and not be seen. The boy I saw played by sight. Next day I had him up at hospital. A complete examination showed no eye defect. Then I stood him 6 metres from the Snellen test. He said he saw nothing. I thereupon put +10D sphere before each eye. Again he said he could not see. Then I put -1D sphere, then -2D, -3D, and so on before the plus ten sphere, until this was reduced to +1D sphere, and he began to read the letters on the test card. When he had +10D and -10D spheres before each eye he read 6/6, the standard vision. I said to him "Well, my boy, you can see well." He replied "Yes, but look at the big glasses I need to see with." So I showed him the marks on the lenses +10 and -10 which showed that although these lenses were big the effect was 0. I saw his answer on his face. Later inquiry showed why this boy persuaded himself to be blind. He had an elder brother who was blinded at birth. He had been in this blind school. The younger brother was so impressed with the reports of the excellence of the blind school he determined to go there also. He persuaded himself he was blind, and some others who admitted him to the school, but by a normal trick I was able to persuade him that he could see, and did see. The final persuasion was without doubt based upon facts, and not upon fantasy.

There is a lesson in that story familiar to all ophthalmologists, or eye-doctors. We always try to explain to a patient the condition of his or her eyes in words they can understand, and by drawings and diagrams that make these conditions plain and easy to understand. It is highly important, so far as is possible, to avoid technical terms and to use plain English words. But there are some conditions for which only technical words can be used. When this is so then a plain meaning should be given.

Recently I saw a very old lady, and she said she had been told years ago that she had astigmatism. It was evident that the word impressed her and she did not know what it meant. So I said that word means something simple. It is Greek " α " meaning not, and "stigma" meaning point. So astigmatism means only that the eye because of its shape has no exact focus, but a glass will correct it. She at once said "I wish I had known that all these years!"

EXPOSURE TO SUNLIGHT

The recommendation or assertion that sight may be improved by exposure to the sun—looking at the sun—is a clear indication of the folly of those folk who assert their knowledge of the best treatment of man's eyes. Nature shows most emphatically that looking at the sun, or any other brilliant light, is a danger, for the reaction of the eye is instantaneous, to shut out this brilliant light. The pupils contract as sharply and as closely as they can so as to reduce to the utmost the entry of excessive light into the eye. The danger and damage of such eye exposure is well known. Just a swift glance at the sun or a bright light is nearly blinding. The eyes see a great dark blot within them which is projected upon any white surface. And, alas, on some occasions that dark blot in the one reading point of the retina has been permanent. The macula of the eye, the one point of the retina which gives us fine detailed vision, is so damaged that it is lost. I have seen such damage in patients who have been careless in looking at a sun eclipse, and in those who carelessly looked at the intense electric welder blast in a factory. Even a moment of such exposure may blind an eye. It then should be thought of the recommendation of the "no glasses dictators," folk should look at the sun as an exercise? I had the answer years ago.

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To healthy-eyed patients, whatever their refraction, the only sane and safe advice is to avoid looking directly at the sun or any intensely bright light.

BLINKING

The suggestion that blinking, conscious blinking of the eyelids, and eye movement right and left or up and down improve sight is a sheer fantasy. While man is awake his eyes, normal eyes, quite unconsciously of thought, are constantly on the move as he walks, rides, reads, and works. No other part of the body works so constantly except the heart. To suppose that blinking is a conscious exercise shows the ignorance of the suggestors! I have watched many folk and counted their rate of blinking.

At a recent meeting of distinguished medical men in the Council Chamber of the British Medical Association I sat in such a position that I could watch the eye blinking of my colleagues without their knowing that I was watching them. There were twenty-two men near enough to count against my stop watch. All were in the fifties or sixties, and in keen active life. The variation in the rate of their blinking was great. Those with under ten blinks a minute numbered 3, the tens numbered 4, the twenties 6, the thirties 6, and those who blinked at a rate over forty a minute numbered 3. I noted the high rate was in those who had travelled long distances that morning, the low rate in those who lived near, and also when they were keen on some part of the discussion.

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But there are forms of "exercise" that I find good, and which I often recommend. The eye lens and cornea and the delicate retina have no blood inside them, they depend upon the lymph extruded from the blood vessels. If this circulation can be increased it is possible in some cases to improve the sight or working of the eye. I find this so in elderly patients who show early lens changes which may in years to come lead to cataract. (It is well never to use this word to patients as describing early lens changes—it alarms them.) The exercise I order is hot bathing. At night, before bedtime, sponging the closed eyes with water as hot as the hands will bear improves greatly the circulation of the eyes. I also find that hot bathing increases the speed of adaptation to night darkness.

THE VALUE OF GLASSES

There is an excellent proof of the value of glasses for work, fine work, in the experience of numbers of women workers of fine fabrics in factories. This work

I was asked to visit a certain well-known school for blind boys, and to report on the conditions and the possible improvement of their eyes. One boy, aged thirteen years, came to me in due course for a preliminary examination. I found no defect in his eyes. Then came the morning interval for the boys, they went into the playground to play football mostly by shuffling about. I sat behind the window curtain to see and not be seen. The boy I saw played by sight. Next day I had him up at hospital. A complete examination showed no eye defect. Then I stood him 6 metres from the Snellen test. He said he saw nothing. I thereupon put +10D sphere before each eye. Again he said he could not see. Then I put -1D sphere, then -2D, -3D, and so on before the plus ten sphere, until this was reduced to +1D sphere, and he began to read the letters on the test card. When he had +10D and -10D spheres before each eye he read 6/6, the standard vision. I said to him "Well, my boy, you can see well." He replied "Yes, but look at the big glasses I need to see with." So I showed him the marks on the lenses +10 and -10 which showed that although these lenses were big the effect was 0. I saw his answer on his face. Later inquiry showed why this boy persuaded himself to be blind. He had an elder brother who was blinded at birth. He had been in this blind school. The younger brother was so impressed with the reports of the excellence of the blind school he determined to go there also. He persuaded himself he was blind, and some others who admitted him to the school, but by a normal trick I was able to persuade him that he could see, and did see. The final persuasion was without doubt based upon facts, and not upon fantasy.

There is a lesson in that story familiar to all ophthalmologists, or eye-doctors. We always try to explain to a patient the condition of his or her eyes in words they can understand, and by drawings and diagrams that make these conditions plain and easy to understand. It is highly important, so far as is possible, to avoid technical terms and to use plain English words. But there are some conditions for which only technical words can be used. When this is so then a plain meaning should be given.

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spatula is inserted under the lid and a horizontal incision is made through the skin 4 millimetres above the lashes. The upper edge is undermined for 2 millimetres, the lower edge is undermined as far as the lashes. The orbicularis is cleared away from the tarsus. A wedge-shaped strip of cartilage is removed from the whole horizontal extent of the thickened tarsus in one strip, thus—An incision 0.5 millimetre deep perpendicular to the tarsus is made just above the roots of the lashes. An oblique incision is then made 2 millimetres above the first incision and the wedge included between the two incisions is removed, its base being between the two incisions. A thin layer of tarsal tissue only intervenes between the apex of the wedge and the palpebral conjunctiva. Removal of the wedge is begun from the outer side in each eye. If the whole cartilage is greatly thickened it may be shaved down. The sutures are now inserted. The needle must be entered through the lower skin-flap near to, but above the lashes, and in front of the cartilage. A horizontal bite of the cartilage close above the groove formed by the removal of the wedge is taken with the needle, which is returned through the lower skin flap 3 or 4 millimetres from its entrance. Four such sutures are inserted, the tarsus being deficient near the inner canthus, the horizontal bite is taken through the soft tissue which replaces it, as high up as possible. The wound is washed free of blood and the sutures are tied by a single knot with a double turn so as to lie horizontally. In the first instance the sutures should be loosely tied, and adjusted later, their tightness being proportionate to the amount of eversion required. Excessive tightness causes strangulation and subsequent necrosis of the lid margin. The edges of the skin are drawn together with a continuous suture. A sterilized gauze dressing is applied and is not removed until the fourth or fifth day after the operation, when the sutures are removed and no further dressing should be required.

The border of the lid after healing has occurred will be thick and unsightly if any excess of cartilage is left below the wedge-shaped groove (MacCallan, 1937).

CONJUNCTIVA

Pterygium is a triangular encroachment of the conjunctiva on to the cornea, at its nasal edge, sometimes a similar encroachment occurs additionally at its temporal edge. Thus the condition appears on the part of cornea corresponding to the interpalpebral fissure. Its origin is due to irritation by wind and dust. If undisturbed the pterygium may become arrested spontaneously, but more usually it grows still further over the cornea, giving an unpleasant appearance or even in advanced cases interfering with vision.

Treatment is purely surgical. The neck of the pterygium is seized with toothed forceps, a squint-hook is forced underneath and the head is separated from the cornea. The head is then tucked under the conjunctiva and fixed there by a suture. Great care must be taken that the raw area left is not in contact with the conjunctiva, it should be touched with a drop of pure carbolic acid.

Pinguecula is a little yellowish elevation at the corneal margin in the same position as a pterygium, to which it is not related. It is not of any pathological significance, but may be removed if desired for the sake of appearances (MacCallan, 1937).

BACTERIAL INFLAMMATION—Inflammation of the conjunctiva may be caused by different bacteria, among which are the streptococcus, the staphylococcus, the bacillus of Koch-Weeks, the diplobacillus of Morax-Axenfeld, the pneumococcus, the gonococcus, and the diphtheria bacillus. Each of these organisms may cause an acute or a chronic conjunctivitis. The attack may start acutely or, beginning as a chronic inflammation, may develop into an acute condition.

In *acute conjunctivitis* the eyelids become hot and irritable, often suddenly. A slight discharge appears, first at the inner canthus, and rapidly increases in

amount. The conjunctiva at first shows a general injection of the superficial vessels, but this soon becomes more marked, and the membrane becomes œdematous. The eyelids become swollen and it may be difficult to open them. Any slight abrasion of the superficial corneal epithelium allows access of bacteria to the corneal tissue and an ulcer results. In severe cases a membrane forms on the surface of the conjunctiva owing to the rapid necrosis of the superficial cells (MacCallan, 1937).

Treatment should be started early if complications are to be avoided, and without waiting for a bacteriological diagnosis. Full doses of one of the sulphonamides should be given with the usual precautions, this may be sulphathiazole or sulphapyridine, four or five grammes a day for two days.

A 2 per cent solution of silver nitrate should be swabbed daily on the everted lids by means of a pledget of cotton-wool twirled round the end of a glass rod or a wooden match. If it is impossible to evert the upper lid, a canthotomy must be done. Thereafter the conjunctival sac should be irrigated every four hours with a weak antiseptic solution. A little ointment should be placed on the edges of the lids to prevent adhesion. If the practitioner cannot swab the lids with silver nitrate solution, the next best course is to drop into the conjunctival sac daily two drops of a solution of acriflavine in castor oil, 1 in 1,500. The greatest care must be taken to prevent injury to the cornea when the lids are manipulated (MacCallan, 1937).

In every case of a *mild inflammation of the conjunctiva* a careful search should be made in a good light for misplaced lashes. These may be removed with epilation forceps but they will grow again. They may be dealt with by electrolysis or diathermy if not more in number than two or three, if more than that Streatfeild's operation is indicated.

It may be said that any case of *chronic conjunctivitis* for which no cause can be found and which resists treatment for three months should be carefully examined for signs of trachoma.

The treatment of chronic conjunctivitis is by the instillation into the lower fornix of the conjunctiva of some astringent drops, such as zinc sulphate or zinc chloride solution 0.25 per cent. If inflammation persists after a few days the conjunctiva of the upper and lower lids should be swabbed with solution of silver nitrate 2 per cent, in no circumstances should solid silver nitrate ever be applied to the conjunctiva. It is the duty of the practitioner before using any solution for the eyes which may be handed to him to assure himself that it is the correct one. Terrible damage to the sight has been known to occur as the result of instillation of caustic solutions by mistake.

On one occasion an ophthalmologist asked the attendant nurse to give him the copper sulphate stick for application to the conjunctiva of a patient with intractable trachoma. The nurse by mistake handed to him the silver nitrate stick, with which the ophthalmologist rubbed vigorously the everted lids. The result was complete opacity of both corneæ.

NON-BACTERIAL CONJUNCTIVITIS—The more common non-bacterial inflammations of the conjunctiva are follicular conjunctivitis, phlyctenular conjunctivitis, vernal conjunctivitis or spring catarrh, inclusion conjunctivitis, which includes swimming-bath conjunctivitis, and trachomatous conjunctivitis.

Follicular conjunctivitis is characterized by the formation of small round dots which are lymphoid aggregations in the subepithelial layer. These are often

the appearance of small bleb-like excrescences on the conjunctiva, especially on that covering the upper tarsal plate, the fibrous structure giving support to the lid with the orbicularis muscle in front and the conjunctiva behind. These blebs when massaged with forceps emit a gelatinous material consisting of broken-down cells. Some of them are dilated follicles and some are interpapillary cysts, for in all cases there is a papillary hypertrophy of the conjunctiva, as in all conditions of conjunctival inflammation.

Stage or type III is similar to type II but exhibits some cicatricial development both of the conjunctiva and of the tarsal plate. The latter becomes thickened and causes slight ptosis. With increase of thickening the tarsal plate becomes slightly inverted, resulting in entropion. The hyperæmia of the lid margin leads to proliferation of the hair follicles and so trichiasis develops.

Stage or type IV visualizes a more or less complete cure, when the whole of the normal columnar epithelium is replaced by scar tissue epithelium. So much damage may already have been done to the tarsal plate and to the lid margins that both trichiasis and entropion may be present.

CLINICAL SIGNS—The many clinical signs of trachoma may now be enumerated, no one of which alone is pathognomonic of the disease.—

(1) *Neovascularization* of the upper fifth of the normally clear corneal tissue; this is called *pannus* when it is of naked-eye dimensions. Pannus means a cloth and it is ridiculous to refer to the cornea as being obscured by a cloth when it is only by optical magnification that the newly-developed vessels can be detected. Without such neovascularization no diseased conjunctiva can be labelled trachomatous. This vascularization is of course the invariable accompaniment of an inflammatory exudate into the substance of a cellular tissue, such as the corneal margin. Like the tarsal conjunctiva the bulbar conjunctiva is flooded with inflammatory exudate which spreads to the corneal margin, hence the neovascularization of tissue previously devoid of blood vessels. During the process of healing the inflammatory exudate is replaced by cicatricial tissue which may be observed as a greyish zone at the upper part of the corneal margin, this sometimes almost entirely obliterates the neovascularization.

(2) *Bleb-like excrescences* covered by œdematous epithelium on the upper tarsal conjunctiva, which on manipulation with forceps emit a gelatinous material.

(3) *Cicatrization of the upper tarsal conjunctiva* seen with the naked eye or perhaps only by using optical magnification.

(4) *Trichiasis* or *entropion* or both together.

(5) *A stiff upper lid*, that is to say on everting the upper lid and removing the fingers the lid remains everted in an abnormal fashion.

(6) *Thickening of the upper lid* with or without ptosis.

(7) *A sinuous margin* of the upper lid.

(8) *Lambal follicles* are little rosettes at the upper periphery of the cornea. When these have cicatrized they present the appearance of little pits.

(9) *Superficial punctate keratitis* is a common accompaniment of trachoma in Egypt.

(10) *Corneal facets* or depressions, the site of former subepithelial follicles of the cornea

ETIOLOGY—The etiological cause of trachoma is a virus which attacks the epithelial cells of the conjunctiva, and when stained with Giemsa solution or other suitable stain can be detected under the oil-immersion lens of a good microscope. The technique of staining the virus is an art which has to be learnt from an expert.

The virus attacks no part of the human frame other than the ocular conjunctiva. Certain monkeys, after inoculation from a human infected conjunctiva, exhibit a disease which is comparable to the human disease but has considerable differences.

TREATMENT—The treatment of trachoma is a matter of great difficulty in view of the important changes which occur, not merely in the conjunctival epithelium and in the subconjunctival tissue but also in the tarsus. In psittacosis the virus can be found in fibroblasts as well as in epithelial cells and I have no doubt that this is also the case in trachoma on account of the remarkable fibroblastic hypertrophy which occurs in so many cases, though this has not yet been reported.

During treatment it is not uncommon for a drop of discharge from a trachomatous eye to enter the conjunctival sac of the operator who has neglected to protect his eyes with goggles. If this happens the conjunctival sac should immediately be irrigated profusely with a normal saline solution or with tap water, if the saline is not instantly available. The whole conjunctiva should then be swabbed with silver nitrate solution 2 per cent and the sufferer should undertake no further work during that day. In spite of such prophylaxis, infection has been known to occur. As an added precaution sulphathiazole may be given in two daily divided doses of five grammes; the usual precautions should be taken during the exhibition of this or any of the sulphonamides.

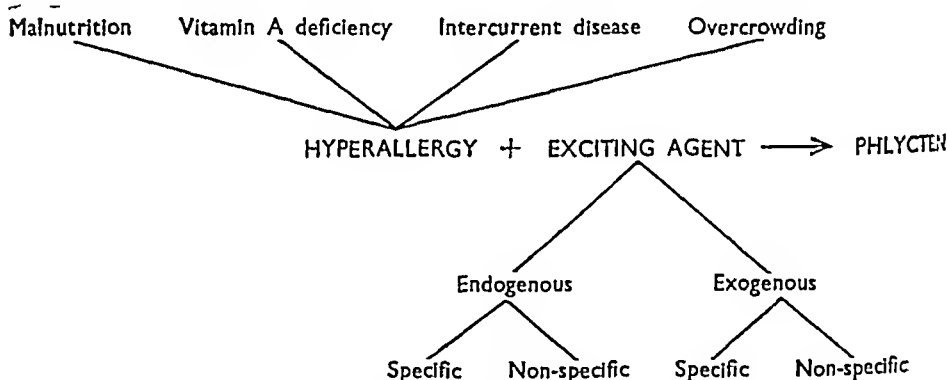
Sulphonamide treatment may be used in full dosage in trachoma exhibiting any hyperæmia or inflammation. It is useless to give small doses for a fortnight or so as this only renders the virus drug-resistant. The test of cure is the disappearance of virus inclusion bodies from conjunctival cells when examined from time to time after long staining with Giemsa. It frequently happens that scrapings of the conjunctiva taken on one day are virus-free, whereas on another virus bodies are found. None of the rapid methods of staining the inclusions are invariably reliable, for I have often obtained a negative result with them, when with the long Giemsa method inclusions could be seen.

When the virus of trachoma has attacked and gained entrance into one or more of the conjunctival epithelial cells it rapidly spreads to other epithelial cells and to the subepithelial tissue and so to the tarsus. One of the most striking effects of the disease is the effect of the virus in causing fibroblastic proliferation in the tarsus. When this process has begun, the application of caustics such as silver nitrate solution and of copper sulphate to the conjunctival superficies cannot be expected to be of much benefit, although no doubt it may keep down the papillary hypertrophy which invariably accompanies any form of conjunctival inflammation.

In *Stage or type I* the swabbing or painting of the conjunctiva with silver nitrate solution 2 per cent daily may be carried out. This is of value in the East

positive Mantoux reactions were obtained against an incidence of 15·3 per cent in a control series of 900 cases of blepharitis. Whatever be the theoretical basis for other allergens as to the cause of phlyctenulæ, clinical evidence points to the tubercle bacillus as the significant agent in human phlyctenulosis. The difficulties that arise from this conception are not inconsiderable. In the first place, clinical evidence of tuberculous disease in children with phlyctenulosis is exceptional. Secondly, phlyctenular ophthalmia is uncommon in the course of tuberculous disease in children. Both these statements, whilst substantially true, do not however, cover all the established facts. In the 592 cases of phlyctenulosis at White Oak Hospital, no less than 6·4 per cent (38 cases) had tuberculous lesions against not one single case in the 900 controls. Furthermore, Siwe (1934) has shown that there is a distinctly higher incidence of phlyctenulosis in Mantoux positive children than in Mantoux negative (4·5 per cent against 0·26 per cent respectively), and that the incidence of phlyctenulosis was nearly three times higher in Mantoux positive children under treatment for tuberculosis than in Mantoux positive children treated for lesions other than tuberculosis (6·6 per cent. against 2·8 per cent.)

TUBERCULOUS INFECTION + SUPERADDED DEBILITY from —



Scheme showing the probable development of a phlycten, illustrative of a non-specific allergic reaction in tuberculous infection

A whole series of additional evidence is available to implicate tuberculosis as the causative factor. It is enough to point to the family history and after-history of children with phlyctenulosis. Some 28 per cent. of a series of children seen at White Oak Hospital gave a positive family history against a computed rate of 3·7 per cent for London children as a whole, whilst 5·3 per cent of 754 children treated between 1921 and 1931 showed notifiable tuberculosis by 1936 against 0·8 per cent in a control series of 1,024 children. The mortality rates from tuberculosis were 0·8 per cent and 0·1 per cent. for phlyctenular cases and controls respectively. Such evidence as this warrants the conclusion that phlyctenular ophthalmia is the local expression of tuberculous infection. Most tuberculous infection runs a subclinical course towards recovery. In the case of the phlyctenular child that silent course is disturbed, either as a result of exogenous specific or non-specific allergens precipitating a spontaneous tuberculin reaction in the conjunctiva.

as a result of a disturbance in the unstable balance between immunity and sensitization. That both these factors are operative is suggested by the frequency of phlyctenulæ in children living with adults with active tuberculosis, and by the poorer prognosis as to the subsequent onset of tuberculous disease and mortality from tuberculosis in phlycten children as compared with Mantoux positive children as a whole.

MODIFIED NON-SPECIFIC REACTIONS

The complex processes of immunity and allergy probably also underlie a more ill-defined series of ocular lesions. If it is assumed that non-specific allergic reactions can occur in the tissues of tuberculous infected patients, and that this non-specific reaction may take different forms depending upon the balance between infection and immunity, the various histological pictures shown by the iris and ciliary body in *chronic cyclitis* become explicable. Chronic cyclitis and *iritis* are not uncommon, and etiological factors are not often established in any particular case. Some clinicians regard focal sepsis as an important exciting cause, but many others incriminate tuberculous infection. There is clinical evidence but no conclusive proof in support of either view, and no real assessment of the problem as yet possible. It is likely that many etiological factors have to be considered, and what has been gained so far amounts to a recognition that the iris and ciliary body may respond to both the toxins of organisms and to the disturbances in the balance between sensitization and immunity.

Bearing on these difficult issues are such relatively uncommon, but intrinsically illuminating, affections as uveoparotid fever (Heerfordt's syndrome) and sarcoidosis (benign lymphogranulosis, Schaumann's disease).

In *uveoparotitis*, the uveal reaction, the enlargement of the salivary glands—especially the parotid gland—and the facial palsy are regarded with considerable validity as a tuberculous lesion. Giant cell systems have been found in the parotid tissue, but the full picture of a tuberculous reaction is none the less lacking.

Equally baffling is *sarcoidosis*, with its multiple manifestations. The nodules in the skin, the miliary reactions in the lungs, the rarefaction in phalanges and the occasional iris nodules all have histological features that suggest but do not quite conform to tuberculosis.

It is possible that all such manifestations are the expression of infection by an organism not unlike the tubercle bacillus, but it is also possible that they represent intermediate stages between the non-specific allergic reaction seen in phlyctenulosis at the one extreme and the specific and characteristic reaction in the caseating tubercle with embedded bacilli at the other. The solution of these theoretical puzzles is the first step towards the rational handling of a mass of relatively common but elusive disease processes.

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CONTACT LENSES

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ALTHOUGH regarded as a modern discovery, it has been pointed out by Ida Mann (1938) that the first publication dealing with contact lenses was dated 1801

It concerned the use by Thomas Young of a home-made affair, consisting of a tube a quarter of an inch long containing water and closed at one end by a lens. The other was smoothed off with wax and applied to the eye. Nothing further was done until 1887, when Saemisch had a patient in whom the cornea was left completely exposed following an operation for malignant disease of the lid. He had a protective glass shell blown by Mülle of Wiesbaden, which the patient wore with comfort and preservation of corneal transparency until his death twenty-one years later.

This patient was probably the first to wear a contact lens in the modern sense of the word and, despite the striking success attending its use, development proceeded slowly and it was not until 1911 that the obvious step of making a ground, as opposed to a blown glass, was taken by Messrs Zeiss. Such lenses are reputed to have been worn by German airmen in the last war, and there is an apocryphal story of a Zeppelin pilot who was shot down, fell several miles through the air, made quite a good hole in the ground, and broke every rigid structure in his body except the contact lens which was found intact on the eye-ball.

A-FOCAL
SPHERICAL
LENSES

Zeiss lenses were occasionally employed in this country from 1919 onwards but they suffered from two defects—

(1) The early types were a-focal, i.e. they had no lens and obtained their optical effect by variations in the radius of the corneal portion. This meant that in myopic

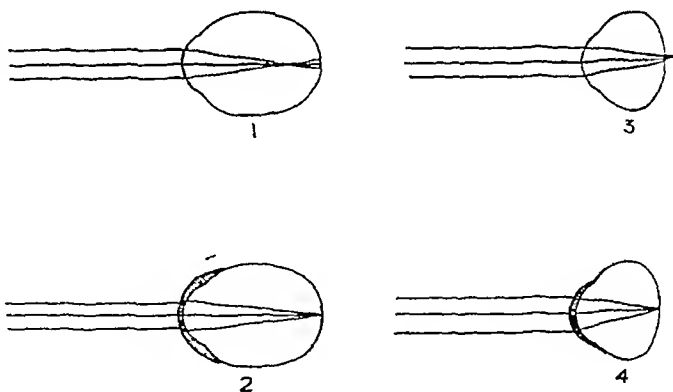


FIG 1—(1) *Myopic eye* uncorrected, a parallel beam of rays comes to a focus in front of the retina (2) *Myopic eye* the curvature of the corneal portion of the contact lens is less than that of the actual cornea, thus diminishing the refractive power of the eye and allowing a parallel beam of rays to come to a focus on the retina. (3) *Hypermetropic eye* a parallel beam of rays comes to focus behind the eye (4) *Hypermetropic eye* the curvature of the corneal portion of the contact lens is greater than that of the actual cornea, thus increasing the refractive power of the eye, and allowing a parallel beam to come to a focus on the retina. In both instances the space between the lens and the eye is filled with normal saline

eyes, the corneal part of the lens had to be flatter than the actual cornea and therefore tended to press against it, in hypermetropic eyes, on the other hand, the curvature was greater than that of the cornea, thus leaving a space of variable depth, supposedly filled with saline but often with bubbles in it (fig 1). This defect was remediable by grinding a lens of the required power into the corneal portion, and this was done later.

(2) The scleral portion was ground to a spherical curve and consisted of a relatively narrow rim. Trial sets of lenses were made up with various combinations of corneal and scleral radii from which it was possible to choose a lens which best fitted the eye, but this "best fit" was not necessarily an accurate one, and it was as a rule only in hypermetropic eyes that the glass could be worn with any degree of comfort. Strebel (1932) intimated that the edge of a Zeiss contact lens would fit only about 33 per cent. of individuals, the remainder showing too much scleral asymmetry, especially near the insertion of the internal rectus, for the lens to be worn with any degree of comfort. It thus became obvious that some form of individual fitting of contact lenses was necessary, if success was to be achieved. It also became obvious that as large an area as possible of the bulbar conjunctiva should be utilized to support the lens if comfort was to be achieved. This again provided an indication for individual fitting since the eye-ball in its anterior half is very far from spherical, the shape varying from one individual to another.

INDIVIDUALLY MOULDED LENSES

The ideal procedure would be to take a mould of the anterior surface of the eye-ball and to construct a contact lens, the internal contours of which conformed to this. Various methods were tried, and Dallos perfected one by using a hydrophilic colloid, negocoll, which is liquid at approximately 106° F and therefore is not uncomfortably hot.

A thin glass shell of approximate fit is filled with liquid negocoll, slipped between the lids, and applied to the cocaineized eye-ball. The negocoll solidifies in three minutes and the shell containing it is carefully removed, a mould of its internal surface being then made with wax (hominit) and pieces of cotton-wool. From this model of the eye-ball in wax a similar one in metal is reproduced, on to which glass can be pressed and a lens of the requisite shape thus made.

Unfortunately, however, even a lens such as this is not a perfect fit, as in the process of taking the mould a certain amount of deformation of the soft conjunctiva is unavoidable, as even the slightest pressure of the eyelids is sufficient to distort the conjunctiva. Nevertheless, contact lenses fitted in this way are a great improvement on spherical lenses and the method is widely used in the United States. If a more perfect system of mould taking could be found, much of the expense and difficulty in making contact lenses would be abolished, but such at present is far from being the case, in fact, the modern tendency is to give up the taking of moulds altogether (see below). This has been rendered possible by the great accumulation of individually fitted contact "shells" (contact lenses without optical power), grouped systematically according to size, shape, depth and curvatures.

Fitting of stock moulds—For an expert contact lens fitter it is a matter of a few minutes to pick out the best approximate fit from this collection, and the order of magnitude of inaccuracy is only a fraction of that resulting by moulding methods.

(50-300 μ as compared with 1-3 mm.) To reduce and eventually abolish every noticeable difference between the surface of the eye-ball and the inner surface of the contact lens the patient is cocainized, the shell inserted, under the lids, and she is instructed to look first to one side, then to the other, and then up and down. Spots or areas of blanching of the bulbar conjunctiva indicate tightness, whereas hyperæmia and wandering air bubbles disclose comparative looseness of the fit. Gradually grinding away layers of glass (with a small grindstone) where the fit is tightest causes the area of contact to spread and the zone of loose fit to contract. In this stage it is practicable to make a plaster cast of the trial shell and scrape away the requisite small portions. A new contact glass made to this shape will probably have a much better or perhaps quite a perfect fit. To verify the accuracy of the fit by inspection and "palpation" (manipulation is perhaps a more adequate term) is anything but easy. It must not be forgotten that in order to examine any single sector of the eye-ball the patient has to look towards the other end of the same meridian thus hiding this latter hemisphere completely, and also the adjoining sectors, to a considerable extent. It is therefore possible to check up half meridians only, one lever arm of the balance, not the whole. The only way of checking up whether all opposite half meridians or sectors are in balance is to draw a horizontal line across the lens and see if this line stays in correct position as the eye moves. Some slight meridional lag, particularly in extreme positions, and some degrees of rotatory play around the antero-posterior axis are permissible and in some cases unavoidable. But a permanent turning of the axis indicates an imperfect fit and presages discomfort in wear.

It will thus be seen that the process of accurate fitting is an elaborate one and as many as twenty or more attendances may be required for a satisfactory result. It is really more of an art than a science and one which can be acquired only as the result of considerable experience. When a satisfactory fit—corneal and scleral—has been obtained, a copy is made in optical glass and the required correction ground into the corneal portion.

In the earlier lenses, this correction was always spherical and such is essential in the Zeiss model, since this is circular in outline and spherical in shape, and so may take up any position. Individually fitted lenses, however, will take up the position of optimum fit and remain fixed. It is therefore possible to grind a cylindrical correction and if necessary a prism, modifications which in certain cases bring about marked improvement in visual acuity and comfort.

INDICATIONS FOR CONTACT LENSES

After this rough outline of how contact lenses are made, the next thing to consider is their properties and the indications for their use.

From the optical standpoint, contact lenses have several advantages over ordinary spectacles —

(1) They move with the eye, a point which is of considerable importance when there is much difference between the refraction of the two eyes and when full field is essential. It is well known that there is no apparent displacement of objects when looked at through the optical centre of a lens. If, however, the direction

if gaze is not through the optical centre, displacement occurs owing to a prismatic effect (fig. 2). When there is much difference in power between the lenses of a pair of spectacles, this prismatic effect causes double vision directly the eyes move from the middle line and renders it impossible to wear the lenses with any comfort. This is one of the reasons why patients who have had a monocular cataract removed cannot achieve binocular vision when wearing a suitable convex spectacle glass in front of the eye which has had the operation and no lens, or a very much weaker one, in front of the unaffected eye. With a suitably made contact glass, however, the eye is always looking through the optical centre of the correcting lens and diplopia is avoided, except perhaps in extreme positions, when the lens may slip a little over the eye-ball.

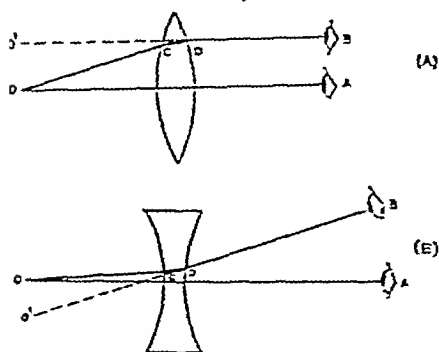


FIG. 2.—Displacement produced by a lens

(A) Convex lens. Eye at A sees O in correct position. At B, the eye is looking through the edge of the lens, the two sides of which act as a prism and bend the rays of light along the path OCDB. The eye B imagines that light always travels in straight lines and therefore that O is along BD produced, i.e. at O' instead of at O, thus causing an apparent displacement of the object upwards.

(B) Displacement produced by a concave lens. B projects the image along BD to O', and so has the illusion of its being displaced downwards.

ocular vision, whereas with the contact lens, where the images of the two eyes are more nearly equal in size, they are more easily combined.

In high myopia, this property is also of use, since an eye of, say, -15D wearing a contact lens, has a 25 per cent. larger retinal image than with an ordinary spectacle lens and hence 25 per cent. improved visual acuity.

(3) When the surface of the cornea is not spherical or not spherically deformed, ordinary spectacle lenses are often of little use in improving vision. Examples of this are afforded by conical cornea, faceted corneal scars occupying the peripheral area and old mustard-gas burns. When a contact lens is worn, however, the thin layer of fluid between its posterior surface and the anterior surface of the cornea fills up the inequalities in the latter and enables the eye to form a clearer image. Occupational indications for contact lenses are fairly obvious, when it is kept in mind that their principal functions are—

(i) That they afford protection to the eye and are almost impossible to scratch when *in situ*.

(ii) They are prevented from fogging by the moisture of the tears.

(iii) They are invisible.

(iv) They cannot be knocked off.

They are thus suitable for th

for occupations in which they are

rain or steam, for swimming and probably for Rugby football. Curiously enough, however, contact lenses are of little value in occupations involving exposure to minute foreign bodies.

An example of this occurred in a carpenter to whom considerable annoyance was caused by sawdust getting in behind the contact lens, and necessitating its removal and cleaning at frequent intervals.

The same reason probably explains the discomfort felt by some wearers in a smoky atmosphere.

EYE IRRITATION

Apart from foreign particles and chemical irritants, there is irritation for which the contact lens itself is more or less responsible. The reaction of an eye to irritation is increased tear production and spasm of the orbicular muscle, also conjunctival hyperæmia, photophobia and discomfort or pain. Although a well-fitting contact lens will cause no mechanical irritation, some watering and a certain degree of increased tension of the eyelids is to be found, if not always noticed. After some time this has the effect of causing the contact lens to get in an even closer contact with the eye and, with this tightness causing more irritation and the irritation further muscular tension, a vicious circle arises which may end in acute discomfort. This is immediately relieved by loosening the lens on the surface of the eye, and not until it gets tight again will the glass cause any appreciable irritation. It will therefore be obvious that however accurate the fit, a certain routine should be followed in training the patient if successful wear is to be achieved.

ROUTINE TRAINING FOR WEAR

The first part of the necessary training is governed by the above considerations, but of course will be largely dependent on individual sensitivity and environment. Once the first "irritation" stage is successfully overcome, the next stage to face is the reaction of the corneal epithelium to prolonged wear of a contact lens. This is known as "Sattler's veil" and is in many ways analogous to that of prodromal glaucoma. Its onset is rather sudden and, at the beginning, varies from one-and-a-half to four hours after the insertion of the contact lens. At night, a halo of coloured rings around lights is noticed, or general mistiness in daylight. The veil disappears as a rule ten to thirty minutes after the removal of the contact lens. As it affects the sight only very slightly and has no other discomfort attached to it, people are inclined to ignore it and should be warned about wearing their lenses for much longer than one hour after the appearance of the veil, as a further increase of the corneal œdema may result in epithelial vesicles and consequent erosions. On the other hand, the veil will persistently appear at much the same time if the lenses are always removed immediately after its onset. To increase the periods of clarity, the best procedure is to wear the lenses for one hour after the veil appears and then remove them. Following this routine with the necessary perseverance, the daily wear can sooner or later be extended to twelve to sixteen hours. A mid-day break of one hour or so is, however, always advisable.

Experiments with a view to shortening the period of training of contact lens wearers have been made on various lines. I have mentioned the great improvement obtained by reducing the mechanical irritation to a minimum through exact individual fitting. Sattler's veil, however, is still a problem. With the older system, the contact lens depended for its optical effect on the fluid separating its posterior surface from the cornea, and the optimum pH and chemical composition of the fluid were the subject of extensive research, but no consistent results were obtained. It appears that the veil has less to do with the composition of the fluid outside than that within the cornea. The less interference there is with the physiological nutrition of the cornea the better will be the results, and this is why accurate fitting, patient training and intelligent wear are of paramount importance.

PLASTIC LENSES

The question of using plastic materials for contact lenses is still *sub-judice*, and is the subject of active research. There is no evidence so far that the physical or chemical properties of plastics are superior to those of glass, but the likelihood of a contact lens being allowed to fall on the floor with consequent breakage, should never be lost sight of and, if for no other reason than the fragility of glass, a plastic should be substituted for it. Furthermore, there is the psychological factor which must be taken into consideration—the feeling of greater safety enjoyed by a wearer of contact lenses if those lenses were plastic instead of glass.

A wonderful future can be envisaged for contact lenses, and a time will doubtless come when ordinary spectacles will be worn little, if at all. This day has certainly not dawned yet, however, and there is quite a lot of work to be done before the use of contact lenses becomes at all widespread. Unfortunately, hastily fitted and badly made lenses are already being supplied to the public and serve to give this type of optical appliance a bad name. With the use of present knowledge, it is only by extremely careful fitting that a satisfactory result can be obtained. There must also, as indicated above, be a period of training the patient in how to use the lenses. If, in his enthusiasm, he wears them for too long at first, the result may easily be a failure. It is hoped that with the facilities which will exist for research after the war, advance will be more rapid than it has been in the last four-and-a-half years. There are several outstanding problems waiting to be settled, and this can only be done by extensive research work aided by a team of capable technicians, who have had adequate training in the making of contact lenses.

I cannot conclude without emphasizing the importance of the pioneer work carried out over many years by Dr. J. Dallos, and without thanking him for valuable suggestions in the preparation of this article.

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ORTHOPTIC TREATMENT

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ORTHOPTIC treatment includes all methods of treatment which aim at re-establishing the normal straight position of the two eyes and at developing the normal binocular vision which will keep the eyes in this position. The more obvious condition which calls for treatment is a squint which can be seen, the less obvious is a heterophoria which may later break down into a squint or, if not developing that far, yet cause eyestrain and considerable discomfort to the patient.

STRABISMUS

⁽¹⁾ Squints are sometimes present at birth but more often occur after the eyes have been straight for some time. The majority of cases are noticed between the ages of two and five years. A much smaller number of children develop a squint between the ages of five and ten years, after this age the development of a concomitant squint without any previous history is unusual. Paretic squints fall into a different category entirely and may follow trauma or disease in later life, they will be discussed separately at the end of this article.

ETIOLOGY AND TREATMENT—At the onset of a squint, treatment should begin as soon as possible.

Refractive error squints—The etiology in approximately 50 per cent of cases will prove to be an error in refraction. This is corrected by suitable spectacles. These can be tied on the child by ribbon threaded through the specially made spectacle frames for babies. Children are often left several years without correcting lenses in the hope that the squint will right itself. Unfortunately, this is unlikely to happen, as the child uses its eyes more as it grows older and emphasises the incorrect position of eyes with the increased visual effort.

Psychological squints—Another cause of the condition is psychological trauma and this accounts for between 10 and 20 per cent of the cases. The treatment here includes first a correction of any refractive error present, and secondly a careful investigation into the psychological background. This may not be easy, but it is essential. If the offending factor is found and removed the squint will in some cases disappear almost immediately; on the other hand, if the cause of emotional irritation remains uneliminated the squint continues and becomes part of the patient's emotional make-up, so that in later life the treatment is complicated by a third factor in addition to the anatomical difficulty of putting the eyes in the straight position and the physiological difficulty of developing normal binocular vision. Probably the most common of the psychological difficulties is jealousy. Combined with the imitative faculty of young children this accounts in many cases for the so-called familial tendency and is demonstrated rather well in cases of unidentical twins when one child has perhaps a marked anisometropia which has caused a squint, whilst the second child has emmetropic eyes and develops a squint later than the first child. Children may imitate each other for fun, but unfortunately

the "old wives" warning that "if the wind changes your eye will stick there" has some truth, the wind may be blameless but the internal rectus having been thrown into spasm by a trick continues to overact irrespective of its owner's wish. That shock, fear, unhappiness and any of the other emotional difficulties of childhood may lead to a squint is not so difficult to understand if it is remembered that normal human binocular vision is a late development of the mammalian visual mechanism. Parents and adults can by unwise remarks unwittingly help to make a psychological squint worse. The condition is akin to a stammer which may sometimes accompany it. Any remark which reminds the child of its abnormality will encourage the state of mind which tends to produce the squint, whether it is an exhibitionism or sense of inferiority. Orthoptic training may have to be delayed or discontinued if the necessary time spent on the eyes provokes psychological disturbance. Training is never of any use if the patient's mind is against the treatment and no amount of coercion will avail. Psychological adjustment must come before local training in these cases.

Squints from other causes —The etiology of the remaining odd 30 per cent may be the disproportionate strength of one or other of the ocular muscles, brought about either by the initial weakness of a corresponding muscle or an acquired weakness brought on by local trouble, such as trauma, infective illnesses or local inflammation. The covering of one eye for local trouble may, by throwing out the normal binocular "stance," produce a squint which is apparent on uncovering. If the eye has taken up a position of rest the deviation will be divergent, if the eye has been irritable and hypermetropia is present it will probably be convergent. Whooping-cough, measles, or any acute illness may act as the starting factor, but often the primary fault is an underlying weakness.

THE AIM OF ORTHOPTIC TRAINING

The aim of orthoptic treatment is to establish two eyes with full visual acuity in each, which will maintain a normal position at any required focus. Normal eyes have parallel visual axes when focusing at a range of thirty metres and approximately parallel down to a range of six metres. From six metres to reading distance of fourteen inches the visual axes must converge sufficiently to allow the image of the object of interest to fall on each macula. This is important, not only for the perfect functioning of the visual apparatus but also from the cosmetic point of view, especially at any range under six metres. If a patient is talking to a companion two feet away from him, his eyes will only look normal if the visual axes are converging equally towards his companion's face. If his visual axes remain parallel, his eyes will look divergent to his *vis-a-vis* or, perhaps more accurately, he will look as if he is thinking of something far away and not paying attention to the matter in hand. In brief, both eyes must be able to focus binocularly.

The first stage in the training is to develop the visual acuity in the weaker eye and this should be started as early as possible. If the weak eye does not fix centrally when the other is covered, or when the child is old enough to be tested on toys or charts, the difference of acuity between the two eyes is marked. A patch stuck on the face completely covering the stronger eye is the most satisfactory measure. Care must be taken to check the vision of each eye every month as the covered eye can become amblyopic in young children, although this rarely happens after the

the difficulties of work. Sometimes no actual deviation is present, but the power of convergence is much weaker than it should be. This means that after the eyes have been converging on close work for some hours considerable strain is felt and the patient complains of being unable to carry on in the afternoon. Young adults form the largest group of these cases. As the fusion sense is well developed orthoptic training can be used to improve the muscle balance and tone and the results are most satisfactory without undue time and trouble. Candidates for flying can often be brought up to the required standard in four or five weeks and they will maintain the standard after hard flying conditions. Some occupations predispose to heterophoria more than others. Any one-eyed work is likely to give trouble, be it microscope work, watch-making or any other work which necessitates the use of one eye with suppression of the other. Fine near work, such as draughtsmanship, may give rise to a worrying esophoria with headaches. After forty years of age exophoria is much more usual than esophoria, which is to be expected if it is remembered that convergence is linked to accommodation, and as the latter begins to fail so convergence deficiency becomes evident. The deficiency in convergence may be found at any age even in children, though much less often than in adults. The onset of the condition may be traced to some debilitating attack, such as influenza, typhoid or measles, and it suggests that the mechanism of the onset is that while the patients under these conditions are unable to amuse themselves normally they read more, but that as the eye muscles both external and internal are also affected by the general lack of tone an incorrect balance is established between the convergence and accommodation. This condition reacts quickly to exercises if the general health has been restored. If on the other hand the patient is still not well, treatment of the eye muscles is unsatisfactory and the convergence readings will tend to correspond to the degree of fitness.

SPECTACLES EXERCISES AND THEIR LIMITATIONS

Eyestrain may be caused by a refractive error, which can be corrected by spectacles and also by an imbalance of the eye muscles, and thus the question often arises as to how far orthoptic exercises can dispense with the necessity for glasses. Exercises cannot alter the refractive error, and short-sighted or astigmatic eyes will need correcting lenses to get full visual acuity. On the other hand, patients with a small degree of hypermetropia and astigmatism may wear spectacles to relieve a strain which is really muscular. Such patients may find, when the muscle balance is restored to normal, that they are quite comfortable without their spectacles, and they can then leave them off. Up to a point a patient with a higher degree of hypermetropia may be taught to control an esophoria without glasses for a limited duration of time, long enough perhaps to appear on a stage or concert platform without spectacles which would interfere with this kind of work. An interesting, although quite logical connexion between muscle balance with presbyopia is evident. A patient of forty-five years of age who is finding reading difficult without a presbyopic correction often shows a deficiency of convergent power. In increasing the convergent power, accommodation is automatically stimulated and the patient finds himself able to do close work without his reading glasses. This is convenient but the real benefit of this link applies to the large group of patients who have a small amount of exophoria. Up to the age of forty-five

they can control the tendency to diverge by the effort of accommodation with its accompanying convergence, but as soon as presbyopic glasses become necessary the stimulus to accommodate is lessened and the exophoria becomes manifest and tends to break down into an actual divergence. With exercises, reading glasses may not become essential until fifty years of age or later. In these cases exercises at home are kept up regularly and such a measure is only worth while when the alternative of spectacles will give rise to headaches and possibly double vision. A person with good muscular balance would probably find it easier to use readers and dispense with the exercises unless his work called for constant change of focus, when it might be worth the trouble to retain as full accommodation as possible for a few extra years. Presbyopia cannot be staved off indefinitely.

NON-COMITANT STRABISMUS

So far the squints discussed have been cases of concomitant strabismus in which no muscle is actually impaired, and these cases are by far the most numerous. The small group in which one or more muscles are impaired, either from peripheral or central damage, includes accident cases affecting the skull, local inflammatory conditions, such as sinus trouble, and general diseases which involve the eyes, such as the exophthalmic ophthalmoplegia in thyroid disease, or nervous lesions such as occur in encephalitis, disseminated sclerosis and others. Some attempt is often made to help patients by exercises. When the condition is due to a general disease little can be done, any improvement easily relapses, and although the patient often feels helped the measurements show that this is more psychological than actual. The traumatic cases on the other hand are well worth undertaking. It is rarely that a muscle is completely paralysed and with time and patience a considerable amount of power can slowly be recovered in the affected muscle, often enough to restrict the diplopia to a lateral segment instead of being present over the whole field of vision.

Double vision accompanying sinus disease can generally be eliminated by exercises once the primary trouble has been cleared. If these patients are not helped they may experience considerable difficulty in reading, as the two images are very close together, and yet the patient is unable to make the correct muscular effort to obtain a single image of the print. Daily exercises at home enable the patient to regain control in a month or so as a rule.

To summarize for this group, the parietic muscles due to a peripheral lesion are worth attempting, paralysis from a central lesion are not.

CONCLUSION

Orthoptic training has been developing slowly since about 1880. Javal in France designed diagrams for the stereoscope, many of which are still used. The stereoscope was used chiefly as an instrument for entertainment since the middle of the nineteenth century, and was widely popular until the cinema arrived. But in using it the eye muscles are automatically stimulated and controlled if the pictures are to be seen in perspective. From the stereoscope, instruments have been developed which can be adjusted to eyes which are not straight. These have become an important adjunct to spectacles, occlusion and surgery in modern orthoptic treatment, which aims at complete normalcy of appearance of the eyes as well as of vision, instead of an approximation to this, which was the most that could previously be attempted.

generally with organic changes in the islet tissue—tumour formation, either adenomatous or malignant. Recent work (Conn, 1940) has shown that a more common form is benign, a functional hyperinsulinism in which excessive insulin activity is compensatory to an excess of carbohydrate in the diet. The condition is not progressive and is responsive to appropriate modification of the diet. In the normal individual a high carbohydrate diet increases and a low carbohydrate diet depresses carbohydrate tolerance and insulinogenesis. In organic hyperinsulinism, insulin production is decontrolled and independent to a great extent of ordinary stimuli. In functional cases, stimuli and insulin responses are excessive and there is a hyper-reactivity, essentially an exaggeration of the normal. It may be that in these individuals the normal mechanism for countering the influence of insulin and preventing the blood sugar falling below a certain level is depressed by fatigue or other cause, but of this there is no certain knowledge.

On clinical grounds it may be difficult to distinguish the functional from the organic form, for in both hypoglycaemic attacks are liable to develop three to four hours after food but, in the benign type, they seldom occur during the night, and the reactionary effect of the evening meal passes off sooner. In the organic form night and early morning are common times for attacks. In the functional form the history of a high carbohydrate antecedent diet is likely to be obtained and also that glucose relieves one attack but only to be followed soon afterwards by another. The shortness of the attacks and their tendency to clear spontaneously is also characteristic.

Some help in the differentiation can be obtained from the examination of the fasting blood sugar, for in the functional type the level is within normal limits or at any rate not unusually low, whereas in the organic form levels of 0.03 to 0.04 mgm per cent are to be expected. Probably the best method of distinguishing the two forms is by a provocative low carbohydrate diet which has a depressing effect on insulin reactivity in the functional form and, as a result of the low carbohydrate diet, the symptoms improve. In the organic form they are exaggerated.

Functional hyperinsulinism usually responds satisfactorily to an appropriate modification in diet—low carbohydrate and high protein. The latter is more slowly absorbed and the 50 per cent. conversion carbohydrate derived from it only reaches the blood stream relatively slowly. The average diet recommended by Conn contains from 120 to 140 gm. of protein and from 50 to 75 gm. of carbohydrate. This is given in three meals a day with, if necessary, additional protein at bedtime. Under such a regime, the symptoms of functional hyperinsulinism clear up in the course of a few weeks.

ANTI-THYROID SUBSTANCES AND THE TREATMENT OF HYPERTHYROIDISM

It is early days to discuss the treatment of hyperthyroidism with such substances as thiourea and thiouracil but there are already indications that a valuable ther-

neutic measure has been discovered, although the merits, scope and limitations have yet to be defined. At the moment these substances are very much on trial but interim reports of cases successfully treated over a short time have already been published. Long-term results have not been observed and there is some question as to whether the short-term beneficial effects can be maintained.

Experimentally and clinically there is reason to suppose that the most likely action of these substances is to interfere with the synthesis of thyroxine. Their administration to animals results in all the signs of deficiency of thyroxine in the peripheral tissues, i.e., a lowered basal metabolic rate and hypothyroidism. Yet the thyroid gland itself becomes hyperplastic and the anterior pituitary too. The thyroid hyperplasia does not occur after hypophysectomy, so it is presumably secondary to the increased activity of the anterior pituitary, the latter presumably a compensatory reaction to the lack of thyroxine in the peripheral tissues and the interference with the synthesis of thyroid hormone in the gland. That the effect is not a peripheral one and due to a neutralization of circulating thyroxine is suggested by the coincident administration of thyroxine abolishing the systemic effect of these substances in hyperthyroidism.

Clinically the trials carried out so far with thiourea and thiouracil in hyperthyroidism have shown a striking similarity in results. The administration of 1 gm. of thiourea three times a day or 1.0 to 1.2 gm. of thiouracil daily in split doses brings relief of the symptoms of hyperthyroidism after a latent period of a week or two. For three weeks or so this dosage is continued and then subsequently reduced. Within three to seven weeks, in the majority of cases, the basal metabolism has fallen to normal and the clinical signs of hyperthyroidism have abated. The protein fraction of the blood iodine in those cases tested has also fallen from high levels to normal limits. After the initial stages in the cases so far treated, a maintenance dose of thiourea of 2 gm. daily has been adopted. At the moment opinions are conflicting as to whether control of the hyperthyroidism is maintained with continued maintenance treatment and whether the condition relapses or not if treatment is discontinued.

It will be interesting to get information about the thyroid gland in cases which came to operation after treatment with these substances, for the crux of the problem in hyperthyroidism is the overactivity of the secretory cells. It could even be expected that an interference with the synthesis of thyroxine and a shortage in the gland and body tissues might tend to induce further thyroid hyperplasia. True this might ultimately result in the gland units becoming exhausted but, judging by thyroid behaviour under other conditions, it might take a long time. Anti-thyroid treatment of this type might well have to be long term.

The question of dosage is obviously important and it may be possible to decrease circulating thyroxine to a normal level but not below, so that any internal stimulus to further thyroid hyperplasia would be avoided. Even then there is still the problem of the overdriven secretory cells and the stimulus which overdrives them.

Further reports of the treatment of hyperthyroidism with these substances must be awaited before their use is widely adopted.

SLOWLY-ACTING PITUITRIN PREPARATIONS IN THE TREATMENT OF DIABETES INSIPIDUS

The control of diabetes insipidus—the posterior pituitary deficiency hypothalamic syndrome—has been much improved by the discovery of slowly-acting pituitrin preparations. Several delayed action compounds have recently been tested out and one of the best, pitressin tannate in oil, has been suggested by Court and Taylor, 1943. This promises to be effective. It contains 5 international units of pitressin per c cm, and the effect of a single intramuscular dose may last for two or three days.

As with other endocrine deficiency syndromes, it is important to decide whether the condition is functional or organic. In the latter case, diabetes insipidus may result either from rupture of the pituitary stalk with a fractured base, pituitary or suprasellar tumours, secondary deposits from carcinoma of the breast or elsewhere, tumours of the third ventricular region or encephalitis. The results of treatment and prognosis in these cases is evidently less satisfactory than in the functional form.

The crux of the problem in diabetes insipidus is the inability of the kidney to concentrate chloride in the absence of the posterior pituitary anti-diuretic hormone. Substitution therapy with pituitrin not only diminishes the polyuria but increases the concentration of chloride in the urine. Controlled observations in three stages—low salt, high salt and high salt diet with pituitrin regimes—will confirm the diagnosis.

In practice it appears that the best method of introducing *pituitrin tannate treatment* is in small and graduated doses at the start. With a preparation of this type in which the effect may last for two or three days, the position is somewhat similar to that with protamin zinc insulin. Unless small doses with adequate spacing are employed it will not be possible to estimate the overlap and cumulative effect.

Court and Taylor (1943) advocate for fourteen days a small daily dose of 0.2 c cm. (1 pressor unit). If the condition is then satisfactorily controlled, 0.4 c cm., every forty-eight hours for three weeks. If control is still adequate, the same dose at three-day intervals. If 0.4 c cm. is insufficient, the dose should be progressively increased.

The chief complication which needs watching for is water retention and this may show itself by headache, drowsiness, oliguria and increase in weight.

This injection treatment of diabetes insipidus can be supplemented, if necessary, by pituitrin snuff (piton or di-sipidin). Frequent inhalation of small doses of these snuffs may be a useful adjuvant and enable the injection dose to be cut down.

The restriction of salt in the diet is a most valuable measure and the dosage of pitressin should be adjusted to the minimum salt intake consistent with ordinary requirements.

GONADOTROPHIC EXTRACTS IN THE TREATMENT OF DEFECTIVE GROWTH

Gonadotrophic extracts of the B type have proved most useful in the treatment of

cryptorchidism Results are due to stimulation of the testes with increase in their size and increased production of male hormone, the latter bringing about an increased development of the parts, relaxation of the tissues and facilitating the channels of descent Success depends on the capacity of the testes to react to stimulation, in their not being ectopic, i e., off the normal track, and on the absence of any anatomical obstruction

Many boys with cryptorchidism are undeveloped and undersized for their age With gonadotrophic treatment a considerable acceleration of growth and development takes place This is similar to the acceleration of growth seen in the normal at puberty and is due to an increased production of male hormone which stimulates the growth cartilages to activity and maturity

Gonadotrophic treatment of this type is useful in stimulating growth in immature and undergrown boys—slow developers but otherwise normal—and this is usually a familial condition This treatment is also useful in boys with anterior lobe pituitary deficiency, in whom the defect of growth and development is usually pronounced As in cryptorchidism, results depend on the capacity of the testes to react to stimulation and on an increased production of male hormone They also depend on the capacity of the growth cartilages to react to stimulation and this again depends on the absence of damage or structural disease Gonadotrophic treatment does not appear to increase the stature of the individual above his normal expectation but rather to accelerate the delayed growth changes of puberty to a more normal age In many retarded boys this may be a distinct advantage In anterior pituitary deficiency, stimulation treatment is essential

If dosage is carefully controlled, there should be no danger of over-stimulation or premature fusion of the epiphyses and no ill-effects are likely to be observed from such treatment It is usual to give 500 units intramuscularly twice a week with one of the gonadotrophic preparations of the B type and for an initial course of, say, four to six weeks and then, after an interval, a second course of the same type if the clinical indications warrant it As regards dosage, however, every individual case should be treated on its merits and according to results

SYNTHETIC ŒSTROGENS IN THE TREATMENT OF CARCINOMA OF THE PROSTATE

Surprising claims have been made in the past few years for the use of œstrogens in carcinoma of the prostate and it is suggested that this treatment not only produces improvement in the patient's general condition but ameliorates bone pains, when secondaries are present, and in some instances results in recession of the primary prostatic growth It certainly appears to merit a full trial Stilbœstrol in daily doses of 0.5 to 1.0 mgm. has been the preparation used The treatment is based on the finding that patients with this condition benefited from bilateral orchidectomy but were made worse by the administration of androgens Then, biochemical investigations on acid phosphatase provided confirmatory support to the clinical view. It was shown that prostatic tissues have a high content of this substance and that in carcinoma of the prostate the serum acid phosphatase is

unusually high. Moreover, it rises higher as the patient's condition deteriorates and after the administration of androgens. Oestrogens on the other hand produce a lowering of the serum acid phosphatase with coincident improvement in the clinical condition. The oestrogen treatment is employed therefore to neutralise the effect of androgens, the principal source of which is the male gonad.

ADRENAL HÆMORRHAGE AND ITS TREATMENT

An apology is perhaps needed for including a most unusual endocrine syndrome—adrenal hæmorrhage—but, if once encountered, it presents a clinical picture which is never likely to be forgotten and, unless the condition is recognized and adequate treatment to combat the adrenal insufficiency employed, a fatal result is almost invariable. There is no reason to believe that the hæmorrhage takes place simultaneously into both adrenals and, if the diagnosis of unilateral hæmorrhage could be made, appropriate treatment might be expected to save the patient. Such a case has in fact been reported.

The clinical features and sequence of events are characteristic—septicæmia with purpura fulminans and peripheral circulatory failure, lividity, coma and rapid sudden death (the Waterhouse-Friderichsen syndrome). It is due to the combination of a fulminating infection (usually meningococcal or streptococcal) with acute adrenal insufficiency, and in a previously healthy individual. Initial symptoms may be suggestive of food poisoning with pyrexia, vomiting and diarrhoea. Signs of peripheral circulatory failure with pallor, shivering, tachycardia and rapid shallow respiration quickly follow. A distinctive rash with petechial hæmorrhages appears over the whole body and this rapidly assumes a remarkable cyanotic hue. With the cyanosis, coma supervenes and, as collapse becomes more pronounced, an extreme picture is presented of lividity so intense and with diffuse purpura and ecchymosis so extensive that the appearance is suggestive of post-mortem staining and lividity. Respiratory embarrassment in the coma stage is most extreme and this is impressive in the absence of any gross physical signs in the cardiac or respiratory system. Post-mortem examination reveals the cause of death as bilateral hæmorrhage into the adrenal glands.

If there is any hope of these patients surviving, the importance of early and active treatment cannot be overestimated. The infective component should be combated with chemotherapy and the acute adrenal insufficiency with large doses of sodium chloride and cortical adrenal hormone.

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THE EARLY MANAGEMENT OF PERIPHERAL NERVE INJURIES

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ALTHOUGH the surgical repair of peripheral nerve injuries is usually a late affair, primary suture is possible in some cases. Indeed, almost all surgeons would agree with Thorburn (1921) who wrote "primary suture of divided nerves is, as it always has been, the ideal method of treatment." But whether or not surgical repair is carried out early or late, and even in those cases in which operative treatment is never required, the final result may be marred if the early management is faulty. Therefore in every case this aspect of treatment must be considered.

DIAGNOSIS

It is often found that immediately after the infliction of an injury detailed examination is neither desirable nor even possible, but the mistake must not be made of forgetting that a nerve lesion may complicate almost any injury to a limb, and a rough examination should always be made. It is especially important to look for the less obvious lesions, such as paralysis of the posterior interosseous nerve or of the posterior tibial below the nerve supply to the calf muscle.

It is often difficult to assess *loss of muscle power*, as the patient, through pain or fear of it, may fail to move a part that is not in fact paralysed. However, when the nerve supply to muscles is normal a flicker of contraction is generally seen, however extensive the damage. Even when applicable, electrical testing is useless in the early days, as the reaction of degeneration does not appear before the fourteenth to eighteenth day. *Sensory testing* is always reliable, however, and when there is any insensibility a nerve lesion must be regarded as existing. It is usually sufficient to test sensibility by the drag-pin method, although if the patient's condition permits there is no objection to testing separately for touch and pain sensibility; and in most cases it will be found that the area of pain loss lies within the area of anaesthesia. The affected part will also show absence of sweating and may be warmer than normal, since the sudomotor and vasomotor fibres to the skin run with the cutaneous nerves and are paralysed with them.

Immediately after the infliction of a severe injury there may be a profound paralysis. It was noted by Weir Mitchell, Stopford and many others that this extensive paralysis frequently cleared up within a few days or weeks, leaving the patient either with a limb that was not paralysed at all or one in which paralysis was limited to one of the main nerves. This phenomenon is due to a non-degenerative type of lesion which has recently been called neurapraxia (Seddon, 1942), and it is the same type of lesion that is frequently seen as the result of

formed, but the treatment of the wound must be planned so as to permit complete closure without undue delay. The first requisite is the prevention of infection and this is best attained by the earliest possible excision of all grossly contaminated and devitalized tissue, followed by immobilization of the affected part in plaster. The technique described by Trueta has done more than anything else to control infection following open injuries.

There is no objection to the application of sulphonamide drugs to a wound in which a nerve is damaged. Although nerves may be injured by large concentrations of these substances, especially if injected intramuscularly, the concentration consequent on a reasonably thorough dusting of the wound is not such as to cause appreciable damage (Medawar and Holmes, 1942).

If a *divided nerve* is seen during the course of the excision, the ends may be brought together by a single catgut suture passed through the extremity of each stump, if part of the nerve has been destroyed, the stumps may be anchored by single stitches to adjoining muscle or fascia. This will prevent retraction and as the part traversed by the suture will have to be sacrificed in any case in order to obtain good surfaces for secondary suture, nothing is lost and something is gained. If, on the other hand, the nerve is not seen, no attempt should be made to hunt for it, anatomical exploration is no part of the operation of excision. Should the paralysed nerve appear anatomically intact, the fact should be noted, as the chances are that the lesion is axonotmesis and therefore likely to exhibit spontaneous regeneration. In such a case it would be reasonable to wait for the time required for spontaneous regeneration to reveal itself before considering secondary exploration, instead of exploring at the earliest possible moment.

The measures that have been taken for the control of infection have also the merit of promoting union of any fracture that may be present, and this is of value so far as the nerve is concerned, in that exploration is not likely to be delayed on account of non-union of bone. Those who, like myself, are convinced of the merits of excision and plaster fixation for the control of infection have, perhaps paid too little attention to the time that is required for complete healing. The absence of serious infection and the rapidity of union of the fracture have been so gratifying that the presence of a granulating surface after such treatment has seemed a small disability. But the patient does not regard it in this light; nor does the surgeon who is called upon to repair a damaged nerve. He cannot carry out an exploration with safety within less than two months of the time of final healing. There is therefore every reason why the skin loss should be made good as soon as the wound has become a granulating surface, frequently this desirable state of affairs is present at the end of three to four weeks, and the application of a razor graft at this time may save the patient many months of invalidism. And it will enable a damaged nerve to be repaired without undue delay. It should not be forgotten that irreversible structural changes in the peripheral stump, and perhaps in end-organs, muscles, and skin, make the prospect of recovery after suture less favourable with every month that passes before the nerve is repaired. The history of the following case shows how quickly recovery may occur if the early treatment is well planned.

E.N., a soldier, was injured on 11.8.41, there was a deep laceration of the right elbow region, and complete radial palsy. Operation Royal Berkshire Hospital, Reading. Excision of all damaged tissue within six hours of the accident; dusting with sulph-anilamide powder; vaseline gauze dressing, enclosure in plaster of Paris

- 23.9.41 Referred to Wingfield-Morris Hospital, Oxford
- 28.9.41 Admitted. Clean granulating area on lateral side of elbow joint
- 1.10.41 Razor graft applied to raw area, after removal of granulation tissue. perfect take.
- 3.12.41 Exploration and suture of radial nerve
- 20.3.42 First sign of recovery
- 18.5.42 Recovery well advanced

Returned to work as a clerk in a joinery works, his pre-war occupation

Time interval between injury and return to work—nine months

WOUNDS IN WHICH PRIMARY SUTURE SEEMS LIKELY TO BE SUCCESSFUL—These wounds range from the small penetrating wounds of arfare, which if treated early may sometimes be closed without risk of subsequent suppuration, to clean glass cuts which almost invariably heal well after suture. It is generally agreed that nerve suture should never be attempted if there is the slightest possibility of infection. A speculative operation, when the surgeon hopes to get away with it," always carries the risk of postponing recovery, for, if sepsis supervenes, it will be at least three months before re-suture can be carried out



FIG. 1
Early management of nerve injuries

Untouched photograph showing unsatisfactory state of median and ulnar nerves at wrist sixteen months after primary suture. There is a large neuroma on each. In the few cases in which there has been opportunity to re-examine nerves after secondary suture, there has not been any such eruption at the suture line.

THE EMERGENCY NARCOTIC TREATMENT OF THE MENTAL CASE

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THE restrictions of war time have enforced an economy of ideas with regard to the emergency sedative treatment of the excited and turbulent mental case. Thus it is that the older and simpler drugs, the "old faithfuls" of psychiatric medicine, are returning to favour. The "asylum hypnotics" of the alcohol-chloral and sulphonal groups (with the present exceptions of alcohol and most recently of sulphonal itself, for which methylsulphonal may be substituted) are all fairly easily obtainable, and for most emergency purposes would provide, together with morphine, hyoscine and bromide, a sufficient armamentarium for the general practitioner who, allured by the newer and more advertised drugs, has in the past rather tended to overlook their well-proven virtues. For this reason, it is proposed to make only the briefest reference to the more complex hypnotics, such as the barbiturates, which, although convenient and time-saving, are not generally speaking so cheap or safe as the more reliable drugs of the alcohol-chloral and sulphonal groups. Moreover, the barbiturates have already received adequate attention in previous issues of this journal.

THE ALCOHOL-CHLORAL GROUP

Alcohol is of special value as a mild hypnotic for the arteriosclerotic type of chronic dementia. Such cases are prone to emphysema and bronchitis, which paraldehyde, by its irritant effect on the bronchial mucous membrane, may aggravate. When obtainable, whisky, or preferably brandy, may be given diluted with warm water.

Paraldehyde ($C_6H_{12}O_3$), a mixture of the polymerides of acetaldehyde, is the institutional sheet-anchor for excited and troublesome cases, because it is the safest and cheapest and perhaps the most convenient of all forms of "chemical restraint". The present price of twelve 120 minim doses is approximately four pence. Its disadvantages are that it possesses a disagreeable taste, and that it may convey to some sensitive individuals an "odour of insanity". When insomnia is unaccompanied by mental symptoms, it is preferable to employ some other hypnotic, such as a barbiturate. Paraldehyde, after a transient initial stimulation, acts as a direct cerebral depressant. Being rapidly absorbed (solubility 1 in 9), it is quick acting, producing deep unconsciousness usually about fifteen minutes after swallowing. The depth is of short duration and is succeeded by several hours of quiet, dreamless and refreshing sleep without unpleasant consequences. It may safely be given to the aged, frail and debilitated and those suffering from heart disorder, as it is non-toxic and (unlike chloral) stimulating to the heart. With some patients it induces an intoxication similar to that provoked by alcohol, - small doses are more apt to be excitant than large ones. When this is the case, the drug is best avoided.

For alcoholic confusional psychoses, no less than for uncomplicated delirium tremens, paraldehyde is the hypnotic *par excellence*, serving the double purpose of narcosis and of substitution therapy. When practising the gradual withdrawal technique, the quantity of paraldehyde is slowly increased in step with the reduction of alcohol until the patient is taking paraldehyde alone, from which point the daily dose of paraldehyde is gradually reduced by suitable stages. Given in small doses of brandy, it is helpful in certain restless cases liable to collapse. Administered per rectum in 360 minim doses, repeated if necessary, it is useful for status epilepticus and for certain mental cases, when it is inadvisable or impossible to give it by mouth. As the drug is to some extent eliminated by the lungs, whereby the secretions of the bronchial tubes are stimulated, its oral administration is not recommended in cases of bronchitis and pneumonia. It is contraindicated in acute nephritis.

The usual dose is 60 to 120 minims, though up to 360 minims can safely be given in many cases as an emergency draught to get the patient under control. For acute excitement, it may be given in 120 to 180 minim doses twice or three times a day until the required effect is obtained. The unpleasant taste may be partly disguised by cinnamon water or extract of liquorice, with or without syrup, the whole dissolved in at least 2 fluid ounces of water to ensure solution. In one mental hospital the solution is prepared in this way—40 ounces of paraldehyde are emulsified with 64 grains of saponin (the active principle of quillaia bark) in 80 ounces of water. Dose 1 ounce. For rectal administration it is given in a dose of 1½ ounces in olive oil or well shaken up in 4 ounces of warm saline. Dose up to 1½ ounces.

Amylene hydrate (dose 30 to 60 minims) is fairly reliable, but it has now fallen into disuse on account of its expense and the fact that a state of excitement may precede the hypnotic action.

Chloral hydrate ($\text{CCl}_3\text{CH}(\text{OH})_2$), according to Grabfield, is "still the most useful of hypnotics and the cheapest." It acts directly on the brain, influencing excitability rather than conduction of nerve. Apart from a general dulling of consciousness there is no analgesia. As it evaporates slowly on exposure to air it cannot be kept in compressed tablets for fear of decomposition. It should not be prescribed with alkalis which decompose it to form chloroform. This effectual and cheap drug has unfortunately fallen out of favour owing to its reputed harmful effects, which in practice are actually non-existent provided that reasonable care is taken with the dosage. There is no substantial evidence that chloral has an action on the heart or vasomotor control (as reputed) or that it is much more dangerous than any of the other narcotic drugs in full doses (Alstead, 1936). When the blood pressure is recorded during chloral administration, the level is not appreciably lower than that which occurs naturally during sleep. A moderate dose, sufficient to produce deep sleep, is not large enough to cause gastro-intestinal irritation, cardiac or respiratory depression. Nevertheless, it is true that chloral, like many other hypnotics, may be dangerous in heart cases and seriously debilitated individuals if a state bordering on deep narcosis is produced. The drug is rapid in action, producing within thirty minutes to an hour a restful sleep, which may last from six to eight hours, and leaves no harmful or unpleasant after-effects.

and chewed, or swallowed with a draught of hot liquid. A useful mixture to combine the slower influence of sulphonal with the quicker effect of paraldehyde is the "A S P" mixture which consists of—

R Aspirin	5 grains
Sulphonal	5 grains
Paraldehyde	30 minims
Water to	$\frac{1}{2}$ an ounce
Dose $\frac{1}{2}$ an ounce t.d.s p.c.	

As sulphonal is now in short supply, methylsulphonal ($(\text{CH}_3)(\text{C}_2\text{H}_5)\text{C}(\text{SO}_2 \cdot \text{C}_2\text{H}_5)_2$, (trional) (dose 10 to 20 grains) may be substituted. It is rather stronger and more rapid in action than sulphonal. Administration must be conducted with the same care. It is best given in cachets, swallowed with a large draught of hot liquid. Sulphonal is preferable, however, when there is a choice.

Ethylsulphonal (tetronal), dose 10 to 20 grains, is more powerful and more easily absorbed than other sulphonals, but is little used.

MORPHINE AND HYOSCINE

A favourite method of quietening an excited or delirious patient is by an injection of hyoscine hydrobromide ($\frac{1}{100}$ grain) and morphine ($\frac{1}{4}$ grain) repeated in an hour if necessary. Hyoscine by itself, is not recommended, as it is apt to cause excitement, not only during the preliminary stage, but also when the immediate effect of the drug has worn off. To serve the purpose desired, morphine is perhaps best used alone, should it be really necessary, as for example in circumstances associated with pain. The opium group should not be used for hypnotic or sleep-producing results when pain is not a factor.

THE BARBITURATES

When a subcutaneous injection is indicated, as an alternative to morphine, hyoscine or both, there are a number of barbiturates, such as somnifane, sodium amytal, from which to choose. Phenobarbitone or luminal is so slow in action as to be almost useless as an emergency hypnotic. Intravenous injections of a suitable barbiturate, such as sodium amytal, nembutal, evipan sodium, pernocton, pentothal sodium, have little place in the emergency treatment of the excited case, for the obvious reason that such an injection would be difficult or impossible without adequate assistance in the case of a struggling patient.

The *urea derivatives*, adalin, bromural and sedormid, and the *carbamates*, such as urethane and hedonal, are too mild in their action to be of much value for emergency use.

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THE INTERPRETATION OF PHYSICAL SIGNS

II—IN LUNG DISEASE

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IN the days before X-ray examination had reached its present high standard the physician was dependent for the diagnosis of intrathoracic disease upon methodical physical examination of the patient and correct interpretation of the signs thus elicited. When studying some of the older textbooks of diseases of the chest, written by clinicians of vast experience, the reader cannot fail to be impressed by the authors' skill in diagnosis and by the accuracy with which their systematic examination was conducted. Their success may perhaps be attributed to two main causes: first the greater amount of leisure and opportunity for careful and unhurried observation possible in those days, secondly, the attention almost invariably paid by them to the study of morbid anatomy, by which they were accustomed constantly to check their clinical findings. Although modern radiology has done much to revolutionize the study of chest disease, and indeed without the information supplied by first-class diagrams the clinician would be working very much in the dark, the value of systematic clinical examination of the chest should never be underestimated. It must be remembered that patients do not come for medical advice labelled with the diseases from which they are suffering. The pathological processes that are at work are, except perhaps in a few cases, hidden from the eye of the examiner, whose diagnosis is reached by an application of inductive logic, a building up of evidence supplied from different sources, until a final picture is developed in which all the details are viewed in proper proportion. Undue dependence upon modern technical methods of investigation (chemical, electrical, and others), and a consequent neglect of the art of physical examination, have resulted in a certain lack of perspective, medical diagnosis has moreover suffered from the comparative neglect of the art of case taking, the value of time spent in eliciting a good history of the patient's illness being too often ignored, if not actually decried. It seems desirable to insist upon these points, since they really lie at the bottom of the difficulty often experienced in the diagnosis of chest disease, in which all available sources of evidence are significant. In the interpretation of physical signs, the importance of which is perhaps in need of some reinforcement to-day, the addition of details supplied by other methods of examination is essential to an adequate solution of the clinical problem.

The time-honoured sequence of *inspection*, *palpation*, *percussion*, and *auscultation* still forms a practical and necessary *modus operandi* in the physical examination of the chest and, although in modern chest work the observer has to rely upon radiological evidence to a degree undreamed of by his predecessors, the combination of systematic physical examination and intelligent investigation of the patient's medical history still gives him invaluable information for which that supplied by mechanical methods alone can never be an adequate substitute. As the

late Sir James Kingston Fowler (1921) once observed in his clinical aphorisms "Those who advise that all stethoscopes should be scrapped may be influenced by the fact that they do not know how to use their own"

It is in the light of the above principles that I wish to discuss the significance of essential physical signs in diseases of the chest, and their interpretation. I have used the expression essential physical signs in order once more to call attention to the tendency to lay too much emphasis on detail in physical examination and to neglect that synthesis of physical signs with clinical history and other sources of information upon which complete diagnosis really depends. Hardly any two instances of the same pathological process within the chest will give identical physical pictures. This is due to some extent to differences in the extent and in the exact situation of the lesion, and also partly to the considerable anatomical variation in normal individuals, a factor for which due allowance must always be made. I have always felt that a great deal of the difficulty experienced by many in the interpretation of physical signs would probably be lessened if more time were spent in systematic inspection, palpation, percussion and auscultation of the chests of admittedly healthy subjects of different builds and with varying degrees of muscular development. Only in this way is it possible to appreciate the normal limits of variation in the shape of the chest, the pitch of the percussion note, the intensity of vocal fremitus and resonance, and the auscultatory characters of the respiratory murmur. That practice on the normal chest should precede any instruction of the medical student in pathological physical signs I regard as a *sine qua non* of good medical education. As a postgraduate exercise I would commend it to any practitioner who may be prepared to devote even a little time to it, whenever opportunity offers.

SYSTEMATIC EXAMINATION

It is, I think, not only impracticable but unnecessary to dwell on all the points included in the textbooks on physical examination of the chest, many of these are found to be superfluous, and I wish to deal only with those which seem to me to be most helpful from a practical point of view.

INSPECTION—Inspection in chest cases, as in any other problem of medicine, should not be confined to the particular region of the body in question, but should include general bedside observation of the patient, in search of numerous other clinical phenomena, many of which may have a real bearing upon the disease present. As an example of this I may mention the problem of the patient with acute caseous (tuberculous) pneumonia, whose illness so often simulates in the early stages a frank lobar pneumonia, both in its onset and in the physical signs of massive lobar consolidation, the true nature of the infection being recognized only at a later period when delay in the expected resolution raises a doubt as to the correctness of the original diagnosis. Nearly always in these cases the respiration rate is considerably below that usually seen in a true acute (pneumococcal) pneumonia. This point should be noted in the preliminary inspection of the patient, since it may give a hint of the possibility of acute tuberculosis at an earlier phase of the disease.

The *short dry cough* associated with involvement of the pleura is another important detail during inspection. It is often most characteristic, and may be a valuable clue in the differential diagnosis between diaphragmatic pleurisy and other acute diseases simulating this condition.

The *presence of pulsation* in unusual positions, whether due to displacement of the heart's apex beat or to an aortic aneurysm or other intrathoracic tumour, is a point which, although mentioned frequently in books, is often ignored in practice. The common causes of cardiac displacement are (1) the presence in one pleural cavity of large amounts of air or fluid which displace the heart and mediastinum over to the opposite side, and (2) diminution in volume of one lung, either from collapse, or from shrinking due to fibrosis, the heart and mediastinum being then displaced to the affected side. Such phenomena as these may be recognized at the outset on inspection of the chest, confirmatory evidence being supplied by obvious immobility of the thorax on the side of the lesion.

The presence or absence of *cyanosis* gives an indication as to the degree of respiratory dysfunction and, in the absence of obvious heart disease, is suggestive of some gross lesion of the respiratory tract. It is likely to be more in evidence in widespread involvement of both pulmonary fields (e.g., in such diseases as diffuse bronchitis and broncho-pneumonia, generalized fibrosis, as seen in silicosis and other pneumoconioses, general dissemination of secondary new growth), than in unilateral lesions, however extensive, when the opposite lung is unaffected.

The presence of *large dilated veins* on the chest, indicating obstruction of the superior vena cava or its main branches, is often one of the first signs of the existence of large masses in the mediastinum due to neoplasm or to the enlarged lymph nodes of Hodgkin's disease.

Clubbing of the fingers is another important phenomenon in chest disease, and should be observed early in the systematic examination. It is, of course, not pathognomonic of any one condition, but often helps to narrow down the diagnosis. In pulmonary tuberculosis it is frequently seen, but is usually slight in degree, unless the disease is of long standing and accompanied by gross and extensive fibroid changes in the lungs. The early stages of clubbing show chiefly the slight curvature of the nails with congestion of the nail-bed and a slightly shiny appearance of the skin immediately adjoining it. Marked clubbing, the ends of the fingers being really bulbous, is suggestive of gross fibroid change in the lungs, and/or the presence of considerable or long-standing septic infection, as for instance, in cases of septic bronchiectasis, cystic disease of the lung, chronic lung abscess, or empyema in which drainage is absent or inadequate.

One feature which should not be overlooked is a *scoliosis*, not so much for its intrinsic significance as because of the extent to which even a moderate degree of lateral curvature of the vertebral column may affect other physical signs, especially the percussion note. A slight but definite dullness in one suprascapular fossa may be thought to be indicative of disease in the upper lobe of the lung when in reality it is due to the asymmetry of the chest. If the curvature is more marked, there may be appreciable atelectasis of one lung and, unless the skeletal deformity is observed, the clinician may be puzzled to account for the consequent alteration of percussion note and relative weakness of air entry on one side of the chest.

PALPATION

Apart from the confirmation of information already obtained by inspection, palpation is often important in eliciting localized pain, and this may give additional evidence in cases of localized pleurisy or of lung abscess. The nature of any abnormal swelling already noticed may be further elucidated, or some pulsation may be detected which had not been observed during inspection.

PERCUSSION AND AUSCULTATION

The character of the percussion note in different parts of the chest and that of the respiratory murmur, with the possible accompaniment of various adventitious sounds, are the physical signs on which, as a rule, reliance is chiefly placed in clinical diagnosis of disease of the lungs. Once more it is necessary to insist on the need for frequent examination of the normal chest, so that the examiner may better determine the variations that may be met with within normal limits. In a chest of average thickness and dimensions the note yielded on percussion has a certain quality which may be described as normal resonance and this can be recognized only by constant practice. It must be remembered that the force of the percussion and the thickness (from muscular development or from fat) of the underlying chest wall are two factors which necessarily modify to a large extent the note obtained, allowance must therefore be made for these, as well as for such normal phenomena as liver dullness, when interpreting the results of chest percussion. Similar factors must also be taken into account when estimating the intensity of the respiratory murmur. I mention these points especially because I have always felt that insufficient attention has been paid to them by teachers of clinical medicine, and from the observations of many of my own students I have gathered that they are often a genuine source of difficulty.

Another point of importance is that the examiner should endeavour to separate in his auditory mind the character of the respiratory murmur (vesicular or bronchial) from that of any added sounds that may accompany it. Failure to do so is a frequent source of much anxiety and uncertainty. Even when all the physical signs present in the chest are accurately recognized and described, it must still be remembered that they only give an indication of the general character of the alterations in anatomical structure of the underlying viscera, and that accurate diagnosis depends, as has been said before, on the correlation of this information with the patient's history, with data afforded by other ancillary methods of examination, and with the examiner's experience and knowledge of general and special pathology. It is almost impossible to give a really satisfactory account of physical diagnosis in chest disease except in rather general terms. I may, perhaps, be able to make things clearer by some concrete examples.

The physical signs of *lung consolidation* are dullness to percussion and alteration in the character of the breath sounds, the normal vesicular murmur being replaced by bronchial breathing, vocal resonance and tactile fremitus are increased, provided the bronchi are still patent. adventitious sounds may or may not be present according to the condition of the solid lung at the time of examination. In numerous clinical classes on physical signs in the chest I have not infrequently found that students find difficulty in interpretation owing to a failure to realize that the signs merely indicate the general alterations in the structure of the underlying organs.

and do not of themselves earmark the particular pathological process which has led to such alterations. Thus, in any patient exhibiting the above signs of pulmonary consolidation, the fact of consolidation must first be noted and then the examiner must think of the different pathological conditions which give rise to it, e.g., diffuse or localized infiltration of the lung by inflammatory products (cellular or fibrous or both), massive infiltration by new growth, or collapse of the lung tissue resulting from bronchial obstruction and absorption of the alveolar air. The decision as to which of these processes has been at work will rest partly on the combination of physical signs present and partly on the clinical history of the illness.

I am conscious that the above method of teaching may appear somewhat lacking in precision, but I feel equally certain that many mistakes in diagnosis are due to the erroneous conception that even common diseases of the lungs have stereotyped physical signs, and that interpretation of the signs in any given case can be achieved otherwise than by some such process of induction as I have endeavoured to indicate.

The classical signs of a large *pleural effusion*, viz. dullness and immobility of the affected side, absence of breath sounds, vocal resonance and fremitus, and displacement of the heart to the opposite side are obvious enough in many cases. Traditional teaching, however, has insisted on this physical picture to such an extent that it has come to be regarded as a *smie qua non*, and there are many quite experienced practitioners who do not realize that the auscultation of obvious and clearly audible breath sounds all over one side of the chest does not necessarily exclude the presence of a considerable quantity of fluid in the pleural cavity; this phenomenon is especially liable to be met with in children.

In these circumstances, ægophony is frequently the sign which attracts the examiner's notice, and raises a suspicion as to the presence of fluid in a chest in which, contrary to expectation, the respiratory murmur is clearly audible. Failure to recognize this fact is sometimes responsible for persistence in the diagnosis of pneumonia and refusal to believe that fluid is present because of audible breath sounds. If any doubt exists in a case in which the unusual clinical course of the disease and an unexplained persistence of pyrexia should suggest the possibility of an empyema, it is surely safer to settle the difficulty by exploratory puncture over the dull area, especially if ægophony, of any degree, has been detected.

One other example may be given of a condition which may cause difficulty in differential diagnosis, viz., a *spontaneous pneumothorax* of sufficient extent to give rise to definite physical signs though not so large as to cause acute and obvious respiratory distress. In these circumstances the hyper-resonance on percussion of the affected side may be attributed to emphysema of the lung, especially if the difference in the note on the two sides is not extremely marked. Apart from the evidence afforded by X-ray examination, which may not always be immediately available, careful physical examination will usually reveal some displacement of the heart's apex beat to the opposite side, to an extent sufficient to suggest if not to demonstrate the real state of affairs. Mistakes of this character, though they should be avoidable by application of the systematic rule of physical examination, do occur in practice. More often than not the reason is the examiner's pre-occupation with the notion that he is dealing with a lung condition, which leads him to ignore examination of the heart in a case that is *prima facie* not cardiological.

By a similar distortion of reasoning the reverse mistake may occur. I have in mind an example of a case in which a cardiologist was called in consultation to see a patient with extreme tachycardia, supposed to be due to hyperthyroidism, in whom he found a large pleural effusion secondary to an endothelioma of the pleura, the heart being intrinsically healthy.

ADVENTITIOUS SOUNDS

A few words may be said about the various adventitious sounds, which sometimes occasion difficulty, partly I think because of the unnecessarily complicated nomenclature by which they have often been described. The simplest and most satisfactory classification is that which divides them into dry and moist sounds. The former include rhonchi, which are heard in conditions in which there is narrowing of the air-passages (e g, in bronchitis and in asthma), and pleural friction, audible on both inspiration and expiration, and often increased by increasing the pressure with which the chest-piece of the stethoscope is applied. The latter, known as râles, are due to the pressure in greater or less amount of moisture, and may be produced in the bronchi or in the alveoli. They may be fine (crepitations), medium, or coarse, according to the site of production, i e alveoli, smaller bronchi, and large bronchi or pulmonary cavities in communication with bronchi.

Of the true significance of moist sounds, which may be heard in a vast number of quite different lung diseases, it is difficult to speak with precision, it is in fact in regard to this aspect of physical signs that I have always felt that much of the regular teaching inclines to be over-dogmatic. In any pathological condition of the lungs in which owing to the reaction of the tissues to some irritant, mechanical, chemical, or bacterial, there is an abnormal quantity of moisture in some part of the respiratory tract, râles may be heard. As the histological condition of the lung parenchyma varies from time to time in the course of the disease, so corresponding variations are found in the adventitious sounds, the presence or absence of râles and their character depending on the state of the morbid process, its progression, retrogression, resolution and so forth.

It cannot therefore be said that moist sounds have anything more than a relative significance, or that they can in themselves be accepted as reliable data either for differential diagnosis or as a criterion of the activity of any specific inflammatory process. This is well illustrated in the case of *pulmonary tuberculosis*, in which especially the evidence of physical signs *per se* is now recognized to be extremely unreliable. In a diagnostic investigation, persistent râles in the region of either apex should always be regarded as highly suspect; their absence, however, and indeed the absence of all abnormal physical signs in the chest, does not exclude a diagnosis of pulmonary tuberculosis, many of the most active and potentially dangerous lesions being recognizable only by radiology. Moreover, the presence of crepitations is not, as is still sometimes erroneously taught, unequivocal evidence of activity in this disease, since they may persist in chronic arrested lesions which can be demonstrated by serial skiagrams to be completely static in a patient who has no evidence of toxæmia and who is leading a normal and even energetic life without detriment. In such a case the added sounds indicate no more than a slight non-specific catarrh in areas of the lung in which fibrotic changes have taken place in the parenchyma surrounding the smaller divisions of the bronchi. Sudden

or gross variations in the extent or in the character of added sounds are much more likely to represent some significant and perhaps serious alteration in the pathological process responsible. The somewhat stereotyped textbook accounts of the physical signs in certain chronic diseases of the lungs, are apt to be extremely misleading, chiefly because they represent an average picture of the condition in question at a fairly advanced stage. It is therefore hardly to be wondered at that the practitioner who does not deal in the course of his work with large numbers of chest cases often experiences difficulty in recognizing such diseases at a really early stage, when physical signs are minimal or even absent.

The *early spreading granuloma* in the "young-adult" type of pulmonary tuberculosis, is perhaps the best example of this, especially as it may be not only unaccompanied by abnormal physical signs, but also symptomless. A similar difficulty occurs in cases of slight bronchiectasis, in which, though the symptomatology usually gives a clue, physical examination may reveal nothing unusual. In both these instances diagnosis is only possible by means of radiological evidence.

One other disease may be cited, viz *primary bronchial carcinoma*. The physical picture here depends mainly upon the collapse of the lung which results eventually from broncho-stenosis. Blocking of the bronchus is, however, a gradual process, and the clinical picture will therefore vary considerably according to the stage of the disease and the degree of obstruction that has been produced. The lesser degrees of pulmonary collapse are often recognizable in an X-ray film long before the physical signs have made their appearance, a little later these may become apparent to some extent, although it may not be until much later that a massive collapse of the lung occurs with the classical picture of a large area of dullness, diminished or absent breath sounds, vocal resonance, and fremitus, and displacement of the heart to the affected side. Such massive collapse may occur with comparative suddenness, and the clinical picture may thus simulate that of some acute pulmonary disease. If, as not infrequently happens, there is a marked degree of fever, and if adventitious sounds are heard over the solid area of lung, either owing to the partial collapse if the bronchus is not completely blocked or because of superadded secondary infection, the picture of an acute pneumonitis is still more in evidence and the apparent sudden onset of the illness still more confusing.

CONCLUSION

I am conscious that the above notes are somewhat sketchy and that to those looking for clear guidance in difficult cases they may appear to be rather disconnected. As an apology for this I must plead that however careful and systematic the clinician may be, medical diagnosis can never be attained by rule of thumb, and successful achievement, though based on rational principles, will always remain something of an art which can only be acquired in the long run by constant practice and by the study of numerous cases, since hardly any two are exactly alike. I venture in conclusion once more to emphasize the importance of perspective in the examination of chest cases, and to insist that, however essential are the details given by the X-ray plant and the bronchoscope, the value of an accurate clinical history and the search for physical signs and their interpretation in terms of anatomy should not be underestimated.

Reference

Fowler, J. K. (1921) "Pulmonary Tuberculosis," London, 267

NOTES AND QUERIES

PURGATIVES IN ACUTE PYELITIS

QUESTION—I was very interested in Dr Peel's article on the treatment of acute pyelitis, but frankly a little worried about the rather drastic purgation which he recommends at the onset of the disease. I have always understood that drastic purgatives favoured absorption of organisms from the bowel. Indeed a genito-urinary specialist once either wrote or said that when a urine had been made sterile for operation on the urinary tract, there was no surer way of bringing infection back again than a dose of castor oil. It has been my practice only to use an enema in acute pyelitis and I should like Dr Peel's comments on this.

REPLY—In reply to the query regarding the use of a purgative at the onset of acute pyelitis, I do not know of any satisfactory evidence that purgatives lead to absorption of organisms from the bowel when used in ordinary therapeutic doses. On the contrary, in conditions such as bacillary dysentery, infantile diarrhoea, and food poisoning, in which the bowel contains virulent pathogenic organisms in large numbers, the prescription of an initial dose of castor oil is almost a routine, this procedure would be extremely dangerous if there were any risk of the organisms being absorbed. The circumstances in which a purgative is dangerous are those in which peritonitis might follow its use, e.g. in acute appendicitis, in typhoid fever, or in intestinal obstruction. The pre-operative use of purgatives in genito-urinary surgery is in a different category. Here the objection to drastic purgation would seem to me as a physician to be well-founded, and lies in the fact that the resulting dehydration increases the danger of shock. It is clear that in "making the urine sterile for operation" in a surgical case, the term "sterile" is only relative, the underlying cause of the infection, and the infective focus in the genito-urinary tract have not been eradicated until operation has been carried out; what has happened is that gross pus has been washed out of the urinary tract by means of a diuresis and that the urine is kept apparently sterile by the same means or by the use of antiseptics. In these circumstances dehydration by drastic purgation will lead to an oliguria and may well result in the transformation of a latent into a manifest infection.

ALBERT A. FITZGERALD PEEL,
D.M., F.R.F.P.S.

SPINAL ANÆSTHESIA IN LEPROSY

QUESTION—Is leprosy, *qua* leprosy (not *qua* concomitant cachexia) a contraindication to spinal anaesthesia? i.e., what changes in the

spinal meninges or cord can obtain in leprosy?

REPLY—I can find no reference to spinal anaesthesia being contraindicated in leprosy. Leprosy is a disease of the peripheral nerves and, although the disease may extend as far as the anterior horns, there is no reason to believe that spinal anaesthesia would have a deleterious effect on the spinal cord or nerve roots.

R. R. MACINTOSH, D.M., F.R.C.S., D.A.

IMMUNIZATION

AGAINST WHOOPING-COUGH

QUESTION—Can the presence of an adequate quantity of "products," indicating the presence of specific immunity, be demonstrated a considerable time after active immunization against whooping-cough, when these "products" may reasonably be assumed to have been absent before the course of immunization?

REPLY—In the majority of children inoculated with whooping-cough vaccine, specific antibodies can be demonstrated in their serum for many months afterwards. It is believed that the presence of such antibodies indicates immunity to infection, although complete proof of this has not been established.

DIETHYLSTILBESTROL IN PROSTATIC CARCINOMA

QUESTION—I am much interested in a note which appears in *The Practitioner*, October 1943, page 252—"Prostatic Carcinoma Treated with Oestradiol and Diethylstilbestrol", and should like to know whether the treatment described has been tried in cases of carcinoma of the stomach or intestinal tract and if so with what result.

REPLY—It is difficult to answer this question. The dramatic success of the treatment of carcinoma of the prostate with stilbestrol and hexoestrol has led to considerable empirical experimentation on carcinoma in other sites. I myself have had a great many letters from people telling me that they have treated carcinoma of the breast with success. I find it very difficult indeed to come to any conclusion, since the observations have usually been made by practitioners, and the essential things, such as sections, and so on, are nearly always missing in cases in which good results have been reported. I think the only line to take is that at present there is no definite indication that stilbestrol or hexoestrol are of any value in the treatment of carcinoma other than carcinoma of the prostate. Of this, however, there is no doubt at all, as I have myself seen many successfully treated cases.

E. C. DODDS, M.V.O., M.D., F.R.C.P.

PRACTICAL NOTES

OCTOFOLLIN A NEW SYNTHETIC
OESTROGEN

OCTOFOLLIN, a new synthetic oestrogen (4,4-dipara-hydroxyphenyl)-3-ethyl hexane) has been used in the treatment of vasomotor menopause symptoms and those due to primary hypogonadism by H. K. Roberts, Ellen Loeffel and C. M. MacBryde (*Journal of the American Medical Association*, October 2, 1943, 123, 261). The series comprised forty-four cases, thirty of symptoms of spontaneous menopause, eleven of artificial menopause after operation, and three of primary hypogonadism. Continuous treatment for periods varying from one to nine months or longer was given in twenty-six cases, and eighteen received interrupted therapy, i.e. 1 mgm daily for two weeks, then omission for two weeks followed by 2 mgm daily for two weeks. The next month the dosage was 5 mgm daily, then 10 mgm and 15 mgm in the succeeding months. Seven of these patients received treatment for five months and eleven for seven months or longer. After an initial dosage of 0.5, 1.0 or 2.0 mgm daily by mouth for six to eight weeks, which dosage gave little therapeutic effect, the dosage in the continuous therapy group was gradually increased to 5 mgm or more daily, severe cases receiving 10 to 15 mgm daily. Of this group of patients good relief of symptoms was obtained in 58 per cent., fair in 21 per cent., poor in 15 per cent. and in one case there was no relief. In the interrupted therapy group eleven of the eighteen patients showed good results; the dosage in these cases was higher, however, than in the continuous therapy group, i.e. average dose 10 to 15 mgm daily. The majority of patients required only 5 to 10 mgm daily for relief of symptoms. When receiving doses of 10 to 15 mgm daily the patients noticed tenderness of the breasts and increased pigmentation of the areolae, and in three cases vaginal bleeding occurred after interruption of treatment. Of the continuous therapy group receiving 5 to 10 mgm daily only 35 per cent. showed any change in the vaginal smears, whereas in the interrupted therapy group vaginal smears of each of the eighteen patients showed slight to moderate change in the cellular type. There was no incidence of nausea in either group, and no toxic effects were noted by liver function tests, blood studies or urine examination. This low incidence of side reactions is of considerable clinical value. The results of the observations indicated that diethylstilboestrol, when given by mouth, is at least five to ten times as potent per mgm. as octofollin.

LOCAL SALINE INJECTIONS IN THE
TREATMENT OF SCIATICA

CURE of sciatica after two to three injections of normal saline solution around the sciatic nerve is recorded by B. L. Chopra (*Indian Medical Gazette*, August 1943, 78, 393). The site of the sciatic notch is found by drawing a line from midway between the outer border of the ischial tuberosity and posterior superior angle of the greater trochanter to the upper angle of the popliteal fossa. The injection site is at the uppermost posterior point of the line. Using a lumbar puncture needle, which causes sharp pain along the whole course when the nerve is touched, four to eight ounces of normal saline solution at a temperature of 104° F are injected from a 30 c.cm. syringe. The injections should be given twice weekly.

THE TREATMENT OF SEVERE BURNS
WITH FATTY-BASE SULPHANILAMIDE
OINTMENT

AN ointment consisting of equal parts sterile lanolin and cold cream, to which was added by thorough dispersion sterile sulphanilamide powder to a 6 per cent. concentration by weight, has been used with success in the treatment of severe second and third degree burns by E. I. Evans and M. J. Hoover (*Surgery, Gynecology and Obstetrics*, October 1943, 77, 367). Briefly, the method of procedure is as follows.—On admission the patient is immediately given an injection of morphine ($\frac{1}{4}$ grain for adults), or sodium luminal with morphine, but no other anesthetic. Attendants and patient are immediately masked, the patient is placed on a stretcher and covered with sterile sheets and towels and, when free from pain, is removed to the operating room where the burned areas are cleansed by gently washing with liberal quantities of white soap and sterile saline. Débridement is carried out and a liberal supply of the ointment is applied to the burned areas. Almost immediately after application of the ointment the patient is relatively free from pain. This anesthetic property of the ointment is one of its most valuable assets. Sterile surgical compresses are then placed over the ointment, followed by a pressure dressing. The patient is put in bed with sterile sheets, then splints, wooden or plaster, are applied. If the burns are infected when first seen this method is not used, instead, warm continuous saline compresses are placed on the burned areas and used until the wounds are surgically clean. If the infection is severe, sulphathiazole is given orally and sulphanilamide powder applied locally. Shock has

of course to be prevented or treated. The authors state that it is wasteful to attempt to restore the blood plasma volume fully before the fortieth to seventieth hour after the burn has been received. In the reported series, except in those cases in which shock was already present, plasma in amounts of 250 to 500 c cm was given in the first twenty-four to thirty-six hours, whatever the extent of the burn. Toxic reactions in the series were practically nil, there was no incidence of cyanosis, and a sulphanilamide rash which developed in three cases cleared up rapidly when sterile petroleum jelly was substituted for the ointment. Persistent local plasma loss occurred in one case only. Average superficial second degree burns were found to be healed when the initial dressing was removed on the seventh to ninth day; deep second degree burns required further dressing but healed by the fourteenth to eighteenth day. The healing of third degree burns depends largely on the time taken by the slough to separate and the formation of healthy, clean granulation tissue, this may occur after fourteen days but large areas may take from four to five weeks before skin-grafting can be carried out. One of the most encouraging features of the method was the good functional after-results in severe burns of the hands and arms, burns of the face also responded with excellent results. Stress is laid on two points—(1) The rate of absorption from the ointment is slow, whereas when a water-dispersible base is used the sulphonamide blood levels obtained are dangerously high, (2) the vital importance of masking, to prevent airborne infection, and the highest degree of asepsis.

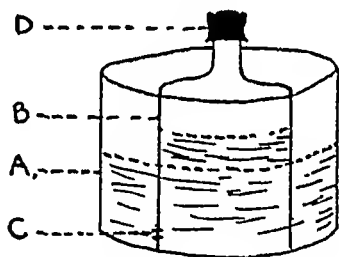
DERRIS ROOT POWDER IN THE TREATMENT OF SCABIES

A REPORT of effective cure within forty-eight hours in 94 per cent of cases of scabies treated with a derris root suspension (2 ounces of derris root to one quart of water containing 1 ounce of soap flakes, warmed to 100° F and freshly made daily) is given by Capt C V A Henriques (*Journal of the Royal Army Medical Corps*, October 1943, 81, 186). The patient is given a hot bath and is scrubbed with soap flakes and water. He is *not dried*. The derris root suspension is lightly scrubbed into the skin with a special soft brush, after which the patient is allowed to dry off in a comfortably warm room before putting on clothing. Disinfection of underclothes, shirt, pyjamas and blankets was carried out, but the battle dress, greatcoat and bedding were left alone. The treatment is repeated five times during the day, at four-hourly intervals. In a total series of 250 cases so treated relapse occurred in only 6 per cent, and these subsequently cleared up after further

treatment. Mild chemical dermatitis occurred in four cases, all red-headed men, it is stated that red-haired individuals should not be given treatment with derris root.

METHOD FOR PREVENTING AIR-CONTAMINATED INJECTIONS

A SIMPLE method whereby the vacuum created in a vaccine or anaesthetic bottle is replaced by sterile air and thereby the risk of air-contamination avoided, is described by Capt. R. Bradbury (*British Dental Journal*, December 17, 1943, 75, 313). A round glass bottle with rubber cap stretched over the neck is placed in a saucepan or sterilizer after a small hole, about $\frac{1}{4}$ -inch in diameter, has been drilled through the side near the bottom. The bottle is boiled for one hour, during which time the air inside expands and bubbles through the small hole. After one hour's boiling the bottle is left in the boiler to cool and as the air in the bottle contracts water enters through the hole, filling about three quarters of the bottle, the upper part of the bottle now being filled with sterile air.



A, Boiler, B, air bottle, C, pressure hole, D, rubber cap

The syringe to be employed should if possible be boiled with the plunger at the full position, if not the plunger must be inserted under sterile water. After wiping the top of the sterile air bottle with a suitable antiseptic the syringe, full of water, is taken from the sterilizer and the needle inserted through the cap of the sterile air bottle. The plunger is pushed in and pulled out, thus emptying the syringe of water and filling it with sterile air. The needle is then withdrawn from the sterile air bottle and inserted through the cap of the anaesthetic or vaccine bottle, the cap having been previously sterilized. The sterile air is injected into the bottle and the solution withdrawn. It is stated that although no facilities have been available to test the sterility of the air in the bottle, as the air is saturated and kept at the temperature of the boiling water for one hour there can be little doubt on the point.

MORPHINE SOLUTIONS IN TIN CONTAINERS

THE packing of single doses of morphine solution in tin containers with needle attached for use in emergencies, a custom adopted by the U.S.A. medical authorities, has led to investigations to test any possible reaction between the morphine compound and the tin container. Christiansen and Jurist (*J Amer Pharm Ass*, 1943, 32, 209) found no loss of potency when solutions of morphine sulphate were in contact with thoroughly cleaned tin surfaces, but there was a fairly rapid development of cloudiness due to reaction with the tin and the formation of a tin oxide or basic tin salt. The corrosion is retarded but not prevented when the morphine sulphate solution is buffered. On the strength of these findings a trial was made to see if the organic salts of morphine would give better results (*Pharmaceutical Journal*, October 16, 1943, 151, 146). Solutions of the acetate, citrate, lactate and tartrate were tested. Slight discoloration occurred with the first three substances, but solutions made with the tartrate, containing $\frac{1}{2}$ grain in 1.5 c.cm. of 0.4 per cent. phenol solution, remained colourless and clear for one-and-a-half to two years. On the basis of this finding it is suggested that morphine tartrate should be used instead of the sulphate or hydrochloride for solutions to be packed in tin containers.

BACILLARY DYSENTERY

CONTROLLED WITH SULPHONAMIDES

A REPORT of the successful control of an outbreak of Sonne dysentery by the administration of sulphonamides is given by H. M. Eisenoff and H. Goldstein (*Journal of the American Medical Association*, November 6, 1943, 123, 624). The outbreak occurred in an orphanage, and fifty children out of a total of one hundred and forty-five were involved. Bacteriological examination of stools showed positive culture in eighty-three cases. The outbreak started with the illness of a boy of eleven, who had persistent diarrhoea for three days. No cultures were made. The child became ill again about three weeks later, this time with fever, vomiting and diarrhoea. A stool specimen was positive for dysentery bacilli. Four other children had developed the same symptoms, and in nine days time all the children on the same floor of the orphanage were ill. The disease then spread and fifty children became ill. Cultures were made of stool specimens of all children in the orphanage, and also of adults employed in the institution. No positive cultures were obtained from the adult specimens, but eighty-three children were positive for *B. sonnei*. Sulphonamide therapy was instituted, four derivatives being employed: sulphathiazole, sulphadiazine, sulphaguanidine,

and succinylsulphathiazole. All children with positive stools were given the drugs for an average of four days. Total inhibition for a time of growth of all intestinal organisms resulted in 80 per cent. of children treated with sulphathiazole, in 70 per cent. of those treated with sulphadiazine, in 63 per cent. of those treated with succinylsulphathiazole, and in 36 per cent. of children receiving sulphaguanidine. There was no definite check up for the duration of total inhibition of intestinal bacteria, but in five children who had positive cultures on February 2, 1943, and to whom sulphathiazole was given from February 4 to 10, there was no growth in stool cultures on February 8, 11 and 15, but on February 24 the cultures gave growths of *Escherichia coli*. In another case in which a positive culture was obtained on February 4, the child was given succinylsulphathiazole from February 6 to 10, no growths were obtained on culture on February 11, but on February 15 there was growth of *E. coli*. Another child, positive on February 22, was given sulphaguanidine from February 24 to 27. Stool cultures on March 1 and 8 did not give any growth, but on March 10 there was growth of *E. coli*. Sulphadiazine was used in the case of a child with positive culture on February 5, the drug being given from February 7 to 10. No growth was obtained from stool cultures on February 11 and 15, but on February 24 *E. coli* was present on culture.

FORMALIN SOLUTION IN THE TREATMENT OF PLANTAR WARTS

A 3 per cent. aqueous solution of formalin has been used in the treatment of plantar warts in a series of thirty-six to forty cases by S. Thomson (*British Journal of Dermatology and Syphilis*, November 1943, 55, 267). The majority were children of school age but some older patients were included. Most of the warts were of the virus type, but there were six cases in which the condition was due to trauma. In eight cases X-rays or radium had been used without success. The method employed was as follows—The patient was told to soak the affected area for ten minutes each night in solution placed in a doll's saucer or plate. The object of this was to ensure that the affected heel or anterior part of the foot should rest in the solution without the thinner skin on the top of the foot being wetted. No other lotions, ointments or plasters were employed. The pain in most cases disappeared after seven to ten days, and at the end of three weeks the warts had become white macerated plugs which could easily be scraped away with forceps. Some cases took seven to eight weeks before cure was obtained. Two patients only, girls in their late teens, failed to respond to the treatment. Only

plantar warts of the sole or palms should be subjected to the treatment as in other areas there is a definite risk of eczematization, this occurred in cases of warts on the face or on the back of the hands

THE INTRAVENOUS ADMINISTRATION OF LANTOSIDE C

LANTOSIDE C, a new glycoside of *Digitalis lanata*, has been shown by experimental and clinical trials to be the least toxic and the most potent of the *D. lanata* glycosides. Its use in the form of cedilanid (Sandoz), which contains 0.2 mgm of the drug in each cubic centimetre of the solution, is reported by J. H. Nicholson (*New England Journal of Medicine*, October 14, 1943, 229, 619). The drug was given in dosage of 8 c.cm. of the solution, by the intravenous route, to a group of twenty-two selected cases consisting of six of rheumatic heart disease with mitral stenosis and regurgitation, two of hypertensive heart disease and fourteen of arteriosclerotic heart disease. All patients had auricular fibrillation, and only one had received digitalis in any form for at least one month before the institution of the treatment. The average age of the patients was fifty-four years, and all had original apical rates of at least 120 per minute, determined by stethoscope. Electrocardiograms were made in all cases in order to rule out coronary artery thrombosis. Irrespective of the original level the heart rate dropped to 85 or below in all cases within twelve hours of receiving lantoside C, the average period of fall being three hours and fifty-four seconds. In two cases there was a rapid drop, from 144 to 72 within fifteen minutes in one case, and in the other from 136 to 71 within thirty minutes. No untoward reactions were noted, except in the one patient who had been partially digitalized before the treatment, in this case there was nausea and mild vomiting for two days. It is stated that all the patients felt better within half an hour of receiving the drug. In patients who, owing to nausea and vomiting or unconsciousness, are unable to take digitalis by mouth, the intravenous administration of lantoside C (cedilanid) by the intravenous route, was found to have the required rapidity of action. It is stated to have a wide margin of safety and to require no fractional dosage.

PERSISTENT UPPER RESPIRATORY INFECTION

A NASAL spray of solution of sulphathiazole sodium 2.5 per cent. and desoxyephedrine hydrochloride 0.125 per cent. (sulmeprin Squibb) has been successfully employed in the

treatment of a case of persistent upper respiratory infection by H. W. Taylor (*Archives of Pediatrics*, October 1943, 60, 565). The patient, a boy aged ten, caught cold after bathing in March 1943. There was acute coryza followed by persistent running at the nose and slight cough for two months, when the child developed catarrhal croup. This cleared up in three days and the nasal drip and slight cough persisted for three months. Physical examination was negative, and examination of the chest and tonsils revealed nothing abnormal. All the usual nasal drops were tried without result. In August 1943 it was decided to try the sulphathiazole-desoxyephedrine nasal spray. This was carried out three times daily. After forty-eight hours there was marked relief, the stuffiness and running at the nose had disappeared, and the cough ceased. The author states that the relief was so marked after the use of the spray that there could be no doubt but that it resulted from the medication.

CONTINUOUS INTRAVENOUS ADRENALINE IN SPINAL ANÆSTHESIA

UNDER this heading F. Evans (*Lancet*, January 1, 1944, I, 15) describes a method for the continuous intravenous administration of adrenaline in saline for the control of blood pressure during spinal anæsthesia. A cannula and stilette are introduced into a suitable vein in the forearm, the stilette is withdrawn and the cannula attached to a saline drip apparatus. The saline is dripped into the vein at 80 or 90 drops per minute for 20 seconds, so that the cannula may be cleared of blood, and then the drip is set at 50 per minute. A blood pressure cuff is applied to the patient's other arm, and a stethoscope strapped to the antecubital fossa. The blood pressure is taken and the patient turned on his side for the spinal puncture. As soon as the spinal anæsthetic has been introduced, and before the patient is turned on to his back, the adrenaline added to the saline in the drip apparatus, the dosage recommended being adrenaline 1 in 250,000 normal saline. This can be obtained by adding 2 c.cm. of 1 in 1,000 adrenaline to 500 c.cm. of normal saline. The speed of the drip now varies with the individual patient and the height of the anæsthesia—the fastest required in the recorded series was 7 drops per minute and the slowest 20 drops per minute. The time for which the drip should be continued depends upon the time the spinal block lasts. The aim of the anaesthetist should be to keep the blood pressure at an adequate level. The approximate consumption per hour recommended is 250 c.cm. of 1 in 250,000 solution.

REVIEWS OF BOOKS

Endocrine Disorders in Childhood and Adolescence By H S LE MARQUAND, M D, M.R.C.P., and F. W. TOZER, M D, M.R.C.P. London Hodder and Stoughton Ltd, 1943 Pp x and 298 Illustrations 49 Price 15s

THE authors point out that the rapid advance in the knowledge of the endocrines and their functions has given little time to arrange the essential facts to form a coherent whole. Thus, formerly the thyroid gland was given the first place in the description of endocrine function, but now the far-reaching researches of the last fifteen years have shown that the pituitary gland has even wider functions in regulating development and in exerting an influence on every other endocrine gland. This was one reason which led the authors ten years ago to search for endocrine disorders in every child who was sent to them, for whatever cause. Two other events occurred at that time which focused attention on this branch of medicine, one was the observation of an unusual case of *pubertas praecox*, the other the publication of Engelbach's *Endocrine Medicine*, a most stimulating work. The physiology of the endocrine glands is then sketched, leading off with that of the pituitary gland, the functions of which are so numerous and important. The pituitary disorders are classified and generously illustrated the conditions of progeria, Simmonds's disease, von Bergmann's pituitary emaciation and anorexia nervosa are grouped by points of interest about the cases described by von Bergmann and those reported by Engelbach as non-adipose primary hypogonadism. Thyro-pituitarism, juvenile hyperthyroidism, toxic nodular goitre, adrenal disorders, lipodystrophia progressiva and mental symptoms in endocrine disorders in childhood, are among the other subjects illustrated. The references are a most welcome feature of this up-to-date volume.

Hermaphroditos The Human Intersex By A. P. CAWADIAS, O B E., M D, F R C P. London William Heinemann (Medical Books) Ltd, 1943 Pp ix and 78 Illustrations 14. Price 15s

THIS is the considered substance of the author's Thomas Vicary Lecture on "Hermaphroditos The Human Intersex." Dr Cawadias adopts the biological approach to the study of intersexuality and rejects as erroneous the division into true and false forms. The human intersex has attracted much interest and a vast literature. The author has devoted much time to the

published work on this fascinating subject, and to the treatment, especially of the more frequent, the milder forms, which have become part of constitutional medicine. In spite of the large amount of work already carried out, the clinical and physiopathological views are so vague that definite lines of treatment are not available. Thus the term hermaphroditism should be abolished or, if kept at all, serve only as a poetical synonym of intersexuality, which is the true scientific medical term. The contemporary attitude towards intersexes reverts to the rational and humane conceptions of the ancient Greeks. Endocrine treatment is in the present state of science the most important method of treating extra-genital intersexes.

A Medical Bibliography A Check-list of Texts Illustrating the History of the Medical Sciences Originally compiled by the late FIELDING GARRISON, M D., and now revised, with additions and annotations, by LESLIE T. MORTON, Librarian, St. Thomas's Medical School. London Grafton & Co, 1943 Pp viii and 412 Price 50s

THIS check-list of texts illustrating the history of medicine, was first undertaken at the suggestion of the late Sir William Osler (1849-1919) by the late Fielding Garrison (1870-1935), who utilized it in his wonderful *Introduction to the History of Medicine*, and also brought out a revised edition of his check-list in 1933 containing 4,186 items. The present edition contains more than 5,500 concise items, and is well indexed. In a pleasant, modestly worded introduction the editor expresses his gratitude to librarians such as Professor H E Sigerist of the Johns Hopkins University, Mr G F Home, librarian of the Royal Society of Medicine, and Mr W J Bishop its sub-librarian. The contents, as mentioned above, have been much expanded, a welcome addition is the space reserved for "conditions and syndromes not classified elsewhere." Each of the separate divisions is arranged chronologically, and thus the reader will find a most convenient arrangement and will expect all medical librarians to keep a copy of Morton's useful work.

Pasteurization By HARRY HILL, F R S N I., A M I S E., F S I A. London H K. Lewis & Co Ltd, 1943 Pp viii and 152 Price 10s

THIS book may be taken as complementary to

NOTES AND PREPARATIONS

THE NUPERCALINE HANDBOOK

FORMERLY known as the "Percaine Handbook," the second edition of the "Nupercaine Handbook" (Ciba Handbook no 2) has just been issued in two parts. Part 1 deals with different aspects of spinal anaesthesia and Part 2 with local, surface, infiltration, regional and caudal anaesthesia. Technique, dosage, indications and contraindications and after-effects are included. Copies of the handbook are available to medical practitioners on application to Ciba Ltd, The Laboratories, Horsham, Sussex.

THE BRITISH ASSOCIATION OF OTOLARYNGOLOGISTS

THIS Association has recently been formed, with W M Mollison, C.B.E., M.Ch., F.R.C.S., as President, L Colledge, F.R.C.S., as Vice-President, V E Negus, M.S., F.R.C.S., as Hon. Treasurer and F C ORMEROD, M.D., F.R.C.S., as Hon. Secretary. The address of the Association is 22 Upper Wimpole Street, London, W 1.

THE CHARTERED SOCIETY OF PHYSIOTHERAPY

THIS is the new name given to the Chartered Society of Massage and Medical Gymnastics, the new name being indicative of the wide scope of work undertaken by Members of the Society, such as remedial gymnastics, electrotherapy, and last but not least measures for rehabilitation of both civilian and Service patients. The address of the Society is Tavistock House (North), Tavistock Square, London, W C 1.

NATIONAL OPHTHALMIC TREATMENT BOARD

As from January 1, 1944, the fee charged by the National Eye Service for a medical eye examination to all insured persons will be 15s. The service is open to any patient whose family income does not exceed £250 per annum at the old fee of 10s 6d. The official address is 79 Sparkenhoe Street, Leicester.

PRINCESS TSAHAI MEMORIAL HOSPITAL FUND

As a lasting tribute to the gallant work of the Emperor Haile Selassie's daughter, Princess Tshai, whose untimely death at the early age of twenty-two was a great loss to her country, a Memorial Hospital is to be erected on the outskirts of Addis Ababa, near the curative hot springs. A partly constructed hospital situated on the site, with ample grounds and space for extension, has been made available by H I M the Emperor of Ethiopia, and it is hoped to

raise a total sum of £100,000 for building and extension of the work of the hospital. Inquiries should be addressed to the Hon. Secretary of the Fund, 3 Charters Road, Woodford Green, Essex, and donations will be gratefully received by the Hon. Treasurer, the Rt. Hon. Lord Horder, c/o Messrs H Reynolds & Co, 9 Greenhalgh Walk, London, N 2.

OFFICIAL PUBLICATIONS

Ventilation and Heating, Pamphlet no 1, issued by the Industrial Health Research Board of the Medical Research Council, and obtainable from H.M. Stationery Office, price 3d, deals with the vital subjects of correct and adequate ventilation both in the interests of health and output, and also with the subject of lighting. Lighting for the preservation of normal sight, for special types of work, the use of spectacles for the work and for defective sight, and the effect of improved vision on the quality and quantity of work are among the topics discussed. The pamphlet is illustrated and is full of helpful suggestions.

Notification of Jaundice (circular 2883), issued by the Ministry of Health, deals with the subject of notification of catarrhal jaundice, acute inflammation of the liver, acute necrosis of the liver, acute yellow atrophy of the liver, toxic jaundice and infective jaundice, as under the Jaundice Regulations, 1943. These steps have been taken in view of the increasing prevalence of infective types of jaundice and the importance of correct estimation of the incidence for the success of the epidemiological and pathological study of the disease. The Regulations so far apply to the Eastern region only.

CONTENTS FOR MARCH, 1944

GYNÆCOLOGY

Hormones used in Gynaecological Practice 1

Professor E C Dadds, M.V.O., M.D., F.R.C. *Dyspareunia* By R. W. Johnstone, C.B.E., M.D.

F.R.C.S.D., F.R.C.O.G.

The Investigation and Treatment of Sterility

By Aleck Bourne, M.B., F.R.C.S., F.R.C.O.G.

The Diagnosis and Treatment of Carcinoma of the Cervix By Gladys Hill, M.D., F.R.C.

F.R.C.O.G.

Ovarian Tumors By Stanley Way, M.R.C.

M.R.C.O.G.

The Interpretation of Physical Signs III—
Diseases of the Nervous System. By C. M. Hinds-Howell, D.M., F.R.C.P.

THE HORMONES USED IN GYNÆCOLOGICAL PRACTICE

BY PROFESSOR E C DODDS, MVO, MD, FRCP

Courtauld Professor of Biochemistry, University of London, Director, Courtauld Institute of Biochemistry, Middlesex Hospital

AS this is intended as a review for those actively engaged in practical clinical work, the theoretical consideration of the subject will be reduced to a minimum and an attempt will be made to deal only with those aspects of the subject which are of practical interest. It follows therefore that the article must be confined to those hormone preparations which are available to the ordinary practitioner and which can be purchased in the ordinary way from the usual pharmaceutical sources of supply. No remarks will be made about preparations which are only available for research purposes. The list will include the following preparations —

FEMALE HORMONES — Oestrogenic preparations such as —

*OESTRONE.

*OESTRADIOL BENZOATE.

*PROGESTERONE, AND ITS SYNTHETIC ANALOGUE OXYANHYDROGESTERONE (ETHISTERONE)

CHORIONIC GONADOTROPHIN AND PREGNANT MARES' SERUM GONADOTROPHIN

*SYNTHETIC OESTROGENIC SUBSTANCES — STILBŒSTROL, HEXŒSTROL, DIENŒSTROL

MALE HORMONES — TESTOSTERONE IN THE FORM OF *TESTOSTERONE PROPIONATE AND *METHYL TESTOSTERONE.

THE POSTERIOR PITUITARY PRINCIPLE, OXYTOCIN.

All the substances given above can be readily obtained under a number of trade names, but the commercial literature always gives the appropriate scientific designation. Perhaps one or two general remarks about the preparations will not be out of place here. The question is frequently asked which preparation of stilbœstrol is best, and if so-and-so's œstradiol benzoate is as good as someone else's. Such questions indicate a complete lack of understanding of the nature of these products. The preparations marked with an asterisk are pure chemical

substances, either obtained from natural sources, or by degradation synthesis, or by complete synthesis, and as chemical substances they are pure. Therefore there is no question of a preference for any one make. In the case of diethylstilbæstrol, for example, the substance's melting point and chemical constitution is accurately known, and it is either pure stilbæstrol or not, therefore the question does not arise of one preparation being better than another. Again, the question of relative potency cannot arise as, being pure chemical compounds, this cannot vary. It must be remembered that this also applies to substances such as œstradiol benzoate, and there is really no need any longer to refer to mouse units and rat units. The substance should be prescribed and thought of in milligrammes.

The preparations not marked with an asterisk are at the time of writing of unknown chemical constitution. Moreover, they have not been obtained in pure crystalline form and therefore cannot be characterized in the way already outlined above. Animal standardization has to be resorted to and in the case of pregnant mares' serum, urinary gonadotrophin and posterior pituitary, it is still necessary to use biological units. The greatest care is taken by the manufacturers to see that the products are so far as possible uniform. Whenever it is practicable, the international standard is employed in the same way as in the case of insulin. The question, however, as to whose posterior pituitary principle is the better cannot be answered with the same exactitude as when the query is made concerning the pure organic compound. If one of the reputable manufacturers is selected, there is of course no need for anxiety as to the quality of the preparation.

The fact that no list has been given of extracts of whole ovarian or pituitary glands to be administered by the oral route may occasion some surprise. It will be remembered that up to ten years ago there was a great advocacy in the use of dried ovaries and pituitaries. It cannot be too strongly pointed out that the advent of exact methods of studying clinical endocrinology and the improvement in methods of animal standardization have literally failed to reveal any potency whatsoever in preparations of this type and, despite a long and occasionally impressive series of papers on the treatment of, for example, the pituitary type of obesity with dried powdered anterior lobes, modern research can confidently dismiss these preparations as being both obsolete and useless.

CLINICAL EXPERIENCE

The literature on the use of hormones in gynæcology is extensive and is unfortunately mainly of overseas origin. It is depressing to realize that in this country where so much pioneer work has been done on the sex hormones by physiologists, zoologists and biochemists, the clinical appreciation of these discoveries has lagged so far behind. Whilst being fully cognizant of the splendid pioneer work done by the American and Continental workers, it should be remembered that the fundamentals of sex physiology were evolved from the pioneer work of F. H. A. Marshall at Cambridge during the past quarter century or so. With the advent of powerful and accurately defined preparations, the American and Continental gynæcologists were quick to see the revolution they would cause in their subject. On the Continent and in America, for example, the use of uterine

biopsy in all cases of menstrual irregularity had become a routine procedure several years before the war. In this country it is unusual, to say the least of it, to find a gynæcological department at a general hospital where such a procedure is undertaken, even in the most rare and special cases. It is depressing to think that a case of amenorrhœa in a young girl, or menstrual irregularity of any kind in a young woman, is treated entirely on expectant lines. There is no doubt that a great deal of the disappointment of gynæcologists in hormone therapy is due to the fact that they are out of touch with the tremendous strides made in the subject of sex physiology. All too frequently cases of amenorrhœa are treated with œstradiol benzoate or with stilbœstrol, without any investigation being made of the state of the endometrium. The indiscriminate use of these compounds cannot be too severely condemned.

It is difficult to review the use of hormones in gynæcology without writing a long account of the clinical and pathological aspects of many gynæcological conditions—a task for which I am in no way suited. I propose therefore to review the uses of these hormones and to classify them as follows —

- (1) Conditions in which their employment has been proved to be fully successful
- (2) Conditions in which hormone treatment has appeared to give good results, but the results are not completely clear-cut.
- (3) Conditions in which, despite successful claims, results are either not confirmed or their use is contraindicated

(1a) *Restoration of menstruation in castrated women* — This observation first made by Kaufmann (1934) has been confirmed repeatedly, and there appears now to be no doubt that provided the correct dose of œstrogenic hormone and the properly timed injection of the progestational hormone be given, a true menstruation, judged not only by bleeding but also by uterine biopsy, can be obtained. That is to say, provided the uterine mucosa is normal, there appears to be no doubt that the menstrual cycle can be completely reproduced and imitated by hormone administration. Apart from its theoretical value, this form of treatment is of course of no practical use and is never employed. From this experiment, an implication has been drawn that menstruation can be produced in every woman. This of course is not true, since the cause of the amenorrhœa may not lie in a deficient ovarian secretion, but may be due to pathological changes in the endometrium which make it unresponsive to hormone therapy. As already pointed out, failure to produce menstruation or at least uterine bleeding in every case of amenorrhœa has led some clinicians to condemn the use of hormone therapy. A moment's consideration, however, will indicate how unfair such a criticism is, because it is known that all cases of amenorrhœa are not due entirely to insufficient ovarian secretion.

(1b) *Treatment of infantilism by œstrogenic substances* — This has been generally successful, provided the case is one of straightforward lack of development and not one of the Fröhlich type, in which only temporary changes can be induced.

(1c) *Suppression of lactation with synthetic and natural œstrogenic substances*—This again has been the subject of a series of papers reporting uniformly successful results. In the opinion of some clinicians, this is perhaps the most striking advance that has been made in clinical endocrinology, and this difficult and extremely painful problem is successfully solved for the first time. The mechanism is not a straightforward inhibition of lactation, and appears to be associated with a suppression of lymphatic engorgement.

(1d) *Treatment of the menopause with œstrogenic substances*—Here again, highly successful results have been reported with the use of naturally occurring hormones such as œstradiol benzoate and the three synthetic œstrogens, stilbœstrol, hexœstrol and dienœstrol. The complete abolition of the vasomotor symptoms and the restoration of normal mentality have been reported by all workers. Its toxic effects have been the subject of a number of papers. The toxic effects have only been reported with the orally active substances and particularly with the synthetic œstrogens. The reports of the most severe reactions have come from America. There appears to be little doubt that the early alarming American publications were the result either of over-caution or lack of experience. None of the later papers has confirmed the high percentage of side reactions, and the general consensus of opinion to-day appears to be that in some 10 per cent of patients some nausea and gastro-intestinal upset may be experienced, but if the dosage is reduced and the patient perseveres, the symptoms disappear and do not return. With regard to this nausea, it must be pointed out that this is of central origin and is not due to the direct irritating effects of the compounds on the intestinal tract, and neither elaborate coatings nor compoundings are likely to be of any value. The phenomenon is probably the same as the vomiting of early pregnancy when the body becomes saturated with œstrogens from the placenta.

A number of contributions to the literature claim that one or other of the synthetic œstrogens is less liable to give rise to toxic effects than another. The work, however, is by no means clear-cut, although there does appear to be a consensus of opinion that the likelihood of producing gastro-intestinal disturbances is greater with stilbœstrol, decreases with hexœstrol, and is probably at a minimum with dienœstrol. There is, however, not enough evidence yet to speak with absolute certainty.

(1e) *Kraurosis vulvæ*—The treatment of this condition with œstrogens, either œstradiol benzoate by injection or stilbœstrol, hexœstrol or dienœstrol by mouth produces the most remarkable results. A number of papers has been published reporting that the condition appears to be relieved and the skin returns to normal. The results can be accelerated by the use of either natural or synthetic œstrogens in the form of ointment. The beneficial effects of these compounds in skin disease associated with the menopause have also been described.

(2a) *Habitual abortion*—The use of progesterone for the first three months in these cases has received considerable attention. The consensus of opinion appears to be that treatment if persisted in greatly enhances the chances of a continued pregnancy. A certain amount of criticism is, however, offered. In the first instance most of the series are small and, secondly, the treatment is combined with rest in bed and the usual sedative procedure. It is therefore difficult to be certain

what part the progesterone plays in relationship to the other standard methods of treatment. There would appear to be no doubt that the injection of progesterone for the first three months in such cases should be proceeded with.

(2b) *The treatment of menorrhagia* —The treatment of this condition with progesterone has become a standard practice. Unfortunately the material is scarce and expensive, hence there is not a spate of literature on this aspect of hormone therapy, as in the case of the cheap synthetic œstrogens.

In an attempt to make progesterone therapy more universally available, the synthetic sterol degradation product oxyanhydroprogesterone has been recommended. This also has the advantage of being active by mouth.

Alternatively, small doses of methyl testosterone are known to have a progestational activity, and the use of this compound has also been recommended. A word of warning must be given concerning the employment of this product. Large doses should not be given to women, and a careful watch for masculinizing effects should be maintained. Most disagreeable accompaniments have been described when large doses have been given over long periods.

That progesterone therapy will not succeed in every case of menorrhagia is obvious, since it can do good only when the condition is due to a deficiency of the progesterone phase of menstruation, and this can only be determined by uterine biopsy.

(2c) *Gonadotrophic principles* —There are available on the market three varieties of these substances —

(i) Chorionic gonadotrophin prepared from the urine of pregnancy. This is available in sterile solution for subcutaneous or intramuscular injection. Its action on the ovary is essentially luteinizing and it possesses little or no follicle-stimulating activity. It has been claimed that it may be used in the treatment of menorrhagia and in fact in any condition in which progesterone deficiency is indicated. A great many publications have appeared on this therapy, but it is not being too sceptical to say that the case is by no means proven, and the treatment should not be recommended.

(ii) Gonadotrophin from pregnant mares' serum. This again is a purified extract from the serum of pregnant mares, and is put up for clinical use in sterile aqueous solution for subcutaneous or intramuscular use. The widest claims have been made for the value of this preparation. The production of ovulation in anovular women has been described, and it is therefore advocated as a treatment for sterility due to anovulation, as a treatment for amenorrhœa due to lack of œstrogenic and progestational secretions from the ovary, and so on.

Here again, the interpretation of clinical reports presents great difficulties. That profound changes in the ovary of the animal can be produced is not denied. On the other hand, it is difficult if not impossible to prove their action in the human subject. With injection followed by laparotomy, changes in the human follicles have been observed, but of course whether this is *post-hoc* or *propter-hoc* is difficult to say. The diagnosis of lack of ovulation is difficult to make, and if the case does not respond to treatment the gynæcologist is unable to decide whether this is due to

failure of the preparation or to the fact that this particular ovary is incapable of response. It would appear that much more experimental work will have to be done before an answer can be given to these problems.

The third type of preparation consists of a mixture of gonadotrophins. One such contains pituitary gonadotrophin with chorionic gonadotrophin.

The theory underlying the use of this type of preparation is that gonadotrophin will supply the follicle-stimulating and -ripening action, ovulation will appear with the formation of the corpus hæmorrhagicum, and this will subsequently be luteinized by the added chorionic gonadotrophin.

Most promising claims have been made for the use of this type of preparation, it being claimed that ovulation has been produced in anovular women and that sterility has been cured. Their introduction, however, is too recent for the claims made to be accepted *in toto*, and more confirmatory evidence must be produced.

GENERAL CONCLUSIONS

The sex hormones present in many ways one of the brightest phases of experimental physiology, biochemistry and organic chemistry. From the therapeutic point of view, at first sight the results appear to be disappointing, but it is hoped that the arguments developed in this article will help to explain the reason for this. Owing to the extremely complicated nature of the sexual cycle in women their use as ordinary medicines given "three times a day after meals" is precluded except in simple replacement therapy of the menopause. For the irregular cycle or perhaps the cycle in which one phase is slightly deficient, the piling in of masses of oestrogenic or progestational substances can only complicate the issue and make the patient's condition worse. An accurate diagnosis of the patient's condition must be made and the appropriate hormone applied at the right time interval.

Finally, a word of warning must be given about the dangers of these substances. They are amongst the most powerful of biological and pharmaceutical agents available to-day. They can be bought by the general public without any restrictions whatsoever, and therefore it is essential that those prescribing them should explain to their patients that prescriptions should not be repeated nor treatment continued except under the supervision of a clinician. Irreparable harm may be done to the ovary by the indiscriminate administration of gonadotrophic substances, whilst the uncontrolled use of substances like testosterone propionate or methyl testosterone in women can produce complications little short of horrifying.

It is a pleasure to thank Dr. Peter Bishop for reading this article and for his suggestions on clinical matters.

Reference

Kaufmann, C. (1934) *Proc. roy. Soc. Med.* 27, 849.

STERILITY

BY ALECK BOURNE, M.B., B.Ch., F.R.C.S., F.R.C.O.G.

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THE conditions of war and the personal and social changes caused by war, together with the awakened public interest in the problem of depopulation in relation to the future changes in "population pressures," have all centred interest on the treatment of individual sterility. Not only the large number of women, compared with those of the pre-war years, who seek advice, but also the establishment of a Royal Commission to consider the trends of population in this country, are objective evidence of the private or personal and the public or national interest in sterility. Much more attention during recent years has been devoted to the prevalence and treatment of male sterility. A consultation on sterility some years ago was entirely concerned with the physical condition of the woman as she presented herself for interview and examination. Little thought was given to her partner, though now it is realized that something like one-third of all sterile couples fail to have children because of some defect in the husband. It is necessary to consider not only the wife or even the husband, but the two as a married couple. As a gynaecologist I am chiefly concerned with the female and in this article shall consider her in some detail, but it must not be forgotten that her husband must be examined with equal thoroughness by one familiar with the male reproductive system and appearances of the seminal fluid.

IMPORTANT POINTS IN HISTORY-TAKING

It is assumed that a woman calls for examination and advice because, although married some years, she has not yet had children. In addition to ordinary history-taking, questions are asked to find out the coital habits of the couple, evidence of underdevelopment of the pelvic organs, of possible pelvic post-inflammatory adhesions, of endocrine disturbance or other interference with ovulation.

(1) *The biological object of coitus* is to place an adequate number of normal spermatozoa in contact with the external os. A secondary result is to influence the secretion of cervical mucus whereby the ascent of the spermatozoa through the cervix and into the uterus and beyond, is made possible. Coitus may be imperfect by reason of pain or obstruction preventing penetration, but it often happens that neither husband nor wife know for certain if adequate penetration has occurred. Official pain may indicate spasm or hymen obstruction which are enough to make penetration impossible and conception unlikely though not impossible. Coitus may be too frequent, whereby the husband may be kept in a constant sub-fertile state by reason of too few or immature forms of spermatozoa, or it may be too seldom, so that a woman who ovulates only occasionally may never be impregnated at the time when the comparatively rare ovum is produced. Coitus may have been frustrated by contraceptive methods for many years. For example, a woman may have been married for seven years but have used control for the first six. The time of effective marriage is therefore only one year,

and on this she cannot truly complain of sterility. Excitement and the orgasm in the female are obviously not essential for conception, for many children are born of women who have never known the orgasm. Nevertheless, I believe that it is a useful biological event as it is always associated with at least adequate secretion of the essential chemiotactic mucus by the cervical glands. When there is no excitement or orgasm the cervix may be unresponsive and remain "dry". The canal in this condition cannot transmit the spermatozoa which need the chemiotaxis of the mucus by which to find and enter the os and a medium in which to ascend to the uterus.

I have noted during post-coital examination that when the woman has not felt the orgasm, an active secretion of mucus is still coming from the external os at least two hours after coitus. If the rate of descending tide of mucus is faster than the rate of travel of the spermatozoon it is obvious that it cannot reach the uterine cavity. On the other hand, when the orgasm has occurred, although the cervix contains mucus none can be seen escaping from the os, in other words there is a mucus medium within the canal but no descending tide.

(2) *Evidence of hypoplasia of the reproductive organs* is chiefly obtained from the patient's account of her menstruation. For example, late puberty, irregular and infrequent menstruation during adolescence, severe first-day dysmenorrhea, scanty loss, short "periods," long and unequal cycles, all suggest a depression of pelvic function. To deduce from the incomplete menstrual function that the ovulation function is also below standard is perhaps an assumption, but clinical experience shows that a woman complaining as above will probably have a small uterus and find conception difficult or even impossible.

(3) *Pelvic adhesions* which seal, occlude or distort the tubes may be the result of salpingitis, suppurative appendicitis or any form of pelvic peritonitis. Evidence of these conditions in the patient's story may be direct or it may be inferred if she describes a labour or especially miscarriage which was followed by febrile illness.

(4) The most sharply-defined endocrine disturbance which commonly depresses fertility is *hypothyroidism*. The woman may be obviously too fat and complain of the other symptoms of hyperthyroid obesity. In addition, irregular, infrequent or scanty menstruation would strongly support the diagnosis.

PHYSICAL EXAMINATION

Physical investigation of a patient should be conducted in the form of a general routine and also in the light of any special information obtained from the interview.

(A) *Ordinary clinical examination* in the consulting room should note any significant departures from the normal, with special reference to signs of hypothyroidism, or virilism. Fibroids may be felt through the abdominal wall, but it is by the vagina that most information may be obtained. First, before passing the finger or any instrument or lubricant, a small piece of neutral wool should be passed by a sponge holder, withdrawn and tested for degree of acidity by the universal indicator. The colour (as shown on the bottle label) will give an approximate idea of the pH. If this is made about two weeks before the next period the vagina will be at the stage of maximum acidity. It should not be below pH 4, but occasionally, especially if the vagina be pale pink, thickly rugose and con-

taining a semi-solid "ground rice" material, the colour is a deep bright red, indicating an excessive acidity. This is important on account of the lethal action of a high acidity on the spermatozoon.

The state of the hymen as a possible organic obstruction and orificial muscular spasm as a cause of functional difficulty (vaginismus) must be carefully examined.

The vaginal mucosa is next inspected through a speculum. Reproductive activity—a vague but useful term—is related to the condition of the mucous membrane. If it is thick, pale and strongly rugose, the general inference is that œstrus at the middle of the month is active, from which, so far as is known at present, it may be assumed that ovulation is normal and regular. If, on the other hand, the mucosa is thin, smooth, more red than pink and only faintly rugose, then it is likely that œstrus, and its corresponding ovulation, is not regular or even present at all. The more the condition of the vagina approximates to that found after the menopause, the less likely is ovulation as a regular monthly event.

The speculum will also show the amount and nature of the vaginal fluid. It can take the form of a normal, turbid, scanty mucoid material, chiefly in the vault, or *profuse, clear or faintly turbid stringy mucus, or thick white fluid resembling pus*, or a semi-solid "ground rice" material. The appearance of the cervix must be noted at the same time. An excess of mucus is often found with a bright-red non-infective erosion. Abnormal secretion to this degree is an obvious factor, making the ascent of spermatozoa difficult. Examination of pus will usually reveal trichomonas as an infecting agent.

Whether or not the cervix points forwards—as in complete retroversion—or backwards, is probably of no importance, as in any case it is inevitable that the os will be bathed in the vaginal pool.

(B) Having inspected the vagina, the secretion and the cervix through a speculum, *bimanual examination* is made to find the degree of development of the uterus and the presence of any coarse lesion, such as a tubal swelling. A common experience is to find the uterus smaller than normal, but on passing the sound it is often surprising to note that the length of the cavity is greater than might be expected. The relative lengths of the corpus to the cervix, however, are not the normal 2 to 1. In the underdeveloped pubescent uterus the relation may be 1 to 1, or in the infantile type 1 to 2. Undersize of the uterus, although indicating a certain failure of the uterine growth impulse, is not incompatible with conception. It seems that women with a small degree of uterine hypoplasia may either be sterile or have to wait some years before they conceive, but it is common knowledge that occasionally a woman who has a really small uterus can become pregnant. The first conception may miscarry, but she has more chance of a normal pregnancy should conception occur a second time. Presumably, mere size of the uterus cannot affect the embedding of the ovum, for the ovum can embed itself in almost any pelvic tissue, and also pregnancy can occur after the operation of utriculoplasty, whereby the size of the uterine cavity is greatly reduced. It is probable that hypoplasia of the uterus, unimportant in itself, is an indication of defective ovulation.

(C) *Tubal patency*—At this stage of the investigation many gynecologists pass a hollow sound into the uterus, pressed well against the cervix, and insufflate the utero-tubal passage. It causes a certain amount of discomfort and sometimes

(F) If the patient shows any suspicious endocrine failure, such as obesity, she should be investigated for evidence. This will be done by estimation of the basal metabolic rate, X-ray of the sella turcica and determination of sugar tolerance.

TREATMENT

Treatment of sterility is admittedly difficult and, on the whole, not highly successful. The present rate of failure indicates that little is known of the processes involved before and during fertilization and that there is little control of such defects as may be discovered.

Considering the female alone it may be necessary to treat (i) defective production of a normal ovum, (ii) obstruction to its entry into and passage down the tube into the uterus, (iii) failure to meet spermatozoa in sufficient number, and (iv) abnormal implantation in the decidua.

The first treatment is that of the woman who, with her only detectable abnormality, is found, after detailed investigation, to have normal endocrine, normal vaginal conditions, and active spermatozoa in the vagina. In such a woman may have waited for five years without success, even when treated by all the different methods, and finally she may be given up as of further help. But it is not uncommon to hear of a woman, after such treatment, that she has conceived and is normally pregnant.

There are many, however, who show very forcibly that there are yet nothing is known. When a real cause for sterility is discovered, usually successful treatment is possible.

The forms of treatment according to what may be discovered are as follows:

(i) *Organic constriction of the vaginal orifice* formed by the overgrowth of fibrous tissue around the posterior border of the hymeneal insertion are easily treated by suitable excision. If the tightness of the hymen can be successfully treated by the use of vaginal glass dilators. Most operations on the hymen are by the incision but also backward division of the posterior half an inch up the vagina, undercutting of the vaginal mucosa and suture of the vaginal mucosa to the perineal skin (perineotomy).

(ii) *Constriction of the vaginal orifice by muscular action (vaginismus)* is impossible to treat. Operations always fail. The psychotherapists claim to cure these patients, and this method should always be tried.

(iii) *Leucorrhoea* is a serious bar to conception because of the irritation of the spermatozoa.

(iv) *Trichomonas* in the child-bearing age is usually due to trichomoniasis. If the condition is treated and cured, provided there is no other cause, conception will probably happen quickly.

(v) If the cause of sterility is an abnormally high acidity. The first indication that the pH may be as low as 3.5. If the condition is the result of a high oestrogenic activity would be cured by

progesterone (or a derivative) injected during the pre-menstrual week, but the dose, and therefore expense, would be very high, the result uncertain and probably maintained only so long as the injections were given. A simpler method of treatment is to ask the woman to give herself a douche of sodium bicarbonate, one teaspoonful to the pint, not more than two hours before coitus. The indication for this advice is finding the pH of the vaginal pool less than 6.0 and all the spermatozoa dead an hour after coitus. Despite a highly acid vagina it is possible for the spermatozoa to survive long enough in the vagina, provided the volume of alkaline seminal fluid is large and the cervix secretes alkaline mucus abundantly during the act.

(3) *Cervical infection* as demonstrated by pus in the canal (comparatively rare) is almost a certain impediment to the ascent of spermatozoa. It should be treated by thorough cautery of the entire length of the cervical canal. After about two months the whole canal has become newly covered by a columnar epithelium. Lacerations, even gross deformities of the external os, seem to have little or no influence on conception, and it is also doubtful if tightness and smallness of the internal os can have any effect on the ascent of spermatozoa. In the days when the only treatment of sterility was dilatation of the cervix, it was thought that coincidence alone could not account for the number of conceptions which followed this operation, but it is a purely empirical measure, the mode of action of which is difficult to explain. The important function of the cervix is its secretion of a thin, alkaline, chemiotactic mucus during coitus. If, for any reason, such as previous amputation of the cervix or lack of emotional interest in the act of coitus, there is either no mucus or too little, the effect may be to prevent conception, either by failing to assist in neutralizing the vaginal fluid or by failing to provide a chemiotactic attraction of the sperms into the external os and a medium within the canal through which they can travel.

The cervical secretion may be tough, viscid, almost gelatinous, as is normally seen during pregnancy or immediately before menstruation. This material is impermeable to the sperm. At the time of ovulation the mucus is most abundant, translucent, fluid and alkaline. This is the ideal medium for the ascent of spermatozoa, and it is rare to find the secretion at this time in the pre-menstrual gelatinous condition. The thin translucent condition of the ovulation period is a response to a high level of circulating oestrogen, and therefore the treatment of a thick gelatinous secretion is by stilbæstrol, one or more milligrammes a day, beginning about the last day of menstruation until the thirteenth day of the cycle. Failure to alter the condition of the cervical secretion is due to the dose of stilbæstrol being too small. In women over fifty-five, I have produced experimentally a typical abundant "ovulation" type of secretion by giving half a million units of oestrogen over a period of three weeks.

The cervical mucus has been described at some length because it plays a most important part in the function of conception. In the usual investigation of sterility not enough attention is given to this part of the mechanism, but the post-coital test is necessary to obtain all the information possible.

(4) A common finding is a *small uterus* or a corpus to cervix ratio of 1 to 1. As has already been said this condition is probably associated with defective ovulation. Genital hypoplasia is not incompatible with conception, but it is more

difficult, as shown by the number of cases of persistent sterility or the long periods of waiting before conception occurs. Despite certain statements by those with a non-scientific bias against contraception there is no real evidence that voluntary prevention of conception is a cause of failure of full genital development. There is some experimental evidence to show that absorption of some substance from the seminal fluid by the vaginal mucosa stimulates the premature development of the genital system of certain immature animals. This needs confirmation, but if further work supports the observation it is possible that a method may be found for treating genital hypoplasia by the vaginal injection or even intravenous injection of the active principle. Meanwhile the only method available is injection of the gonadotrophic hormones of the pituitary, or administration of stilbœstrol after the period and some form of corpus luteum preparation during the week before the period. This method is likely only to be of value in the very young. It seems that after the age of twenty-five or so there is no response to this form of therapy.

(5) It is claimed that *tubal occlusion* can be treated by repeated insufflation. Whether or not pressures up to 200 mm. are able to break down adhesions it seems certain that one or more insufflations of the tubes form a successful treatment. From a large number of cases Rubin has shown that pregnancy followed after five years of sterile marriage in 21.6 per cent. of cases of strictured or adherent tubes. Similar results are claimed as a result of injection of the uterus and tubes with lipiodol.

Operations on the tubes for occlusion nearly always fail, except when the mischief is no more than adhesion of the fimbriæ or occlusion of the fimbrial openings by filmy adhesions. When salpingography shows a normal tube except for fimbrial occlusion, the operation of salpingostomy is justifiable. Solomons reports 32 pregnancies following 72 operations for this form of obstruction, 16 patients becoming pregnant within one year of operation.

(6) *Defective or infrequent ovulation* is probably a cause of much sterility for which there is no other obvious reason. Prolan A (the follicle-stimulating hormone) can produce great follicular activity in small rodents, but on the whole it has failed to produce any results in clinical trials.

The hormone for clinical use is obtained from the serum of the pregnant mare at about the fourth month. It is probable that the dose used for clinical purposes is far too small to stimulate ripening of follicles.

"Subminimal" doses of X-rays to the ovaries have also been used as a stimulant. That they touch the ovary may be inferred from the frequent disturbance of menstrual function, and a number of pregnancies have been reported following this treatment. But it is possible that danger to the following generation may be a result of irradiating the ovaries. I have been informed by a biologist that the effect of this treatment on some animals is to produce fetal deformities in the first or even second generation. Until more is known of the biological effects of X-rays on the germ plasma it would be wise not to advise it as a clinical treatment.

(7) Lastly, there are the cases of *disturbed endocrine function* which show themselves chiefly by obesity and amenorrhœa. There are also other types associated with hirsutism and signs of virilism. Hypothyroid obesity is as a rule easily treated by thyroid extract and suitable diet. As soon as the weight declines substantially and menstruation becomes normal, conception is likely to follow.

the secretions of the Bartholinian and cervical glands is lacking and the labia, hymeneal membrane and vaginal walls are dry. In such circumstances the attempted coitus is inevitably painful, and is indeed only a few degrees removed from a legitimized rape. Fortunately such "ill-mating" may be avoided or rectified by ordinary consideration and gentleness on the husband's part, but, if it persists and the woman comes under medical care, the cause is usually found to be inflamed and exquisitely tender hymeneal tags (*carunculæ myrtiformes*) or an infected, tender hymeneal laceration resulting from the first crude attempts.

The presence of such tender spots at the introitus of the vagina is the most common cause of the protective contraction of the muscles known as physiological vaginismus. The danger is that if conditions are allowed to continue unremedied the woman's fear of the pain may become deep-rooted and she may develop such a distaste for the very thought of coitus that even the successful treatment of the tender spots may not suffice to cure her of what has become the almost uncontrollable habit of contracting the muscles around the orifice. In other words the *physiological vaginismus may become almost a psychopathic one, and such a case may require patience and simple psychological advice and treatment as well as physical treatment*.

The diagnostic examination of these patients must be carried out with extreme gentleness. Sometimes the mere attempt to investigate the condition of the vulva sets up a muscular contraction, involving the adductors of the thighs as well as the vulvar muscles, which defeats the examiner. In such cases it is better to conduct the examination under a general anæsthetic and to be prepared to carry out any requisite treatment at the same time. The examination involves a careful visual inspection of the vulva and introitus vaginæ as well as digital palpation.

TREATMENT—In the milder cases all that is needed is, first, abstinence from coitus and the application of a simple antiseptic such as dettol ointment until all raw areas have completely healed.

Secondly, some simple advice to the husband on the necessity of gentleness and avoidance of haste in his approaches.

Thirdly, the provision of a lubricant, such as petroleum jelly (with or without 5 per cent cocaine, according to the degree of fear which the patient shows), to be used at the first few subsequent acts of coitus, until the patient gains confidence that the act is not necessarily painful.

In cases in which it is necessary or thought desirable to give an anæsthetic for the diagnostic examination the opportunity should be taken to stretch the vaginal orifice thoroughly. For this purpose the blade of a Sims' speculum with plenty of antiseptic lubricant (e.g. dettol cream) should be used and the perineum thoroughly "ironed out." Stretching has the advantage over incising that it saves the time spent in the healing of the wound. But if cutting is necessary—as, for example, in the case of an unduly tough and resistant hymen—it should be radical, the whole hymen being cut away at its base with scissors and the upper and lower margins of the linear raw area brought together with fine catgut stitches to promote healing.

by first intention. Ample time must be given for healing to become complete, and then begins the important effort to cure the tendency to vaginismus. This is effected by the use of graduated glass vaginal dilators with the phallic shape of a test tube, the aim being to inspire the patient with confidence that an object as large as the erect penis can in fact be introduced into the vagina without pain. A graduated set of three or four dilators is required (fig 1).

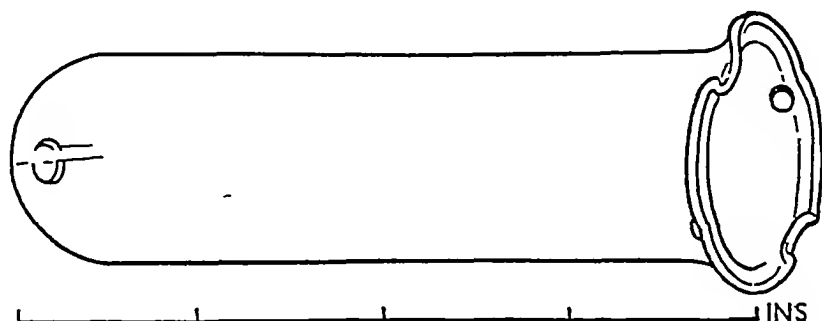


FIG 1
Vaginal dilator, 3rd size (drawn to scale)

The smallest size—about the thickness of the forefinger—is lubricated and gently introduced by an understanding nurse or the practitioner, and the patient remains in bed for a couple of hours twice a day with the dilator in position. When tolerance is achieved a larger size is used, and so on up the series. After the first day the patient should be instructed how to introduce the lubricated dilator herself. This is a point of great importance as the patient will more quickly gain confidence when she knows that she herself controls the instrument, and only confidence will allay the tendency to defensive spasm of the muscles. In some cases the first introduction of the dilators by the patient herself may be advantageously effected while she is in a state of muscular relaxation in a hot bath. Later applications should be more prolonged in duration.

This treatment must not be hurried, and in the meantime an opportunity should be made to have a talk with the husband and explain things to him. Indeed the education of the husband is only second in importance to that of the wife, and stupidity on the part of either may undo much of the good of careful treatment.

When the treatment is completed and marital relations are to be resumed, the patient should be advised to use a lubricant petroleum jelly on the first few occasions lest nervousness should inhibit the natural secretions, and to separate the labia with her fingers and guide the penis into the introitus, just as she has learned to do with the vaginal dilator.

Fear, or shrinking on the part of the woman, apart from the fear of pain following the early attempts at coitus already discussed, is usually associated with sexual frigidity. This is too wide a subject to be discussed in detail here. Suffice it that the hypogonadic type of woman often suffers from dyspareunia if she strays into the paths of matrimony, and her prospects of a happy sexual life are not improved by the tendency which, according to some psychopathologists, such

THE DIAGNOSIS AND TREATMENT OF CARCINOMA OF THE CERVIX

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CARCINOMA of the cervix is the most common form of malignant disease of the female reproductive tract and, as such, its importance can hardly be over emphasized. Moreover, in the early stages, when alone it can be treated with any degree of confidence, its symptoms are often slight and may even be overlooked altogether by the patient. For this reason, most careful attention must be paid to apparently trivial complaints, and indeed some authorities consider that every parous woman should present herself regularly for examination at intervals of six months with a view to the early detection of the condition.

TYPE OF PATIENT

The patient is almost invariably a parous woman, or one who has had some trauma to the cervix. Carcinoma of the cervix is exceedingly rare in virgins, parturition, abortion, operation or even infection of the cervix generally precede the neoplasm. The age incidence is wide, ranging from the early twenties to the eighth decade of life, the majority of cases, however, occur in women between forty-five and fifty-five years.

TYPE OF GROWTH

Because to some extent symptoms vary with the type of growth, brief reference must be made to the main pathological varieties. These are—

(1) *Ectocervical*—The growth is squamous celled, and starts on the vaginal surface of the cervix, it may be either (a) a deep excavating ulcer or (b) a proliferative cauliflower growth, of these two the latter gives more noticeable symptoms at an early stage.

(2) *Endocervical*—The growth is an adenocarcinoma, originating in the columnar celled epithelium which lines the canal. This is the type which most signally fails to produce early symptoms, and which therefore may well only be detected in the initial stages should a vaginal examination be undertaken as a routine or in the course of some other investigation. The cervix is enlarged and hard, but not unlike the hypertrophic condition which follows chronic cervicitis, the sequel of parturition. Symptoms are negligible until the malignant process breaks through to the vaginal surface.

(3) *Polypoid*—A cervical polypus, apparently innocent, may prove on microscopical examination to be carcinomatous. When a patient presents symptoms attributable to a cervical polypus, it is wise to submit the polypus to the pathologist as a routine measure, and to be sure that in a parous woman removal of the

Polypus is carried out thoroughly, with excision of the base and curettage of the anal. These precautions are doubly important, since cases so discovered in a clinically innocent neoplasm offer the best chances of complete cure when treatment is properly instituted. Incidentally, when carcinoma of the cervix complicates pregnancy, it appears often to originate in a polypus.

SYMPTOMS

There is one outstanding symptom of this disease, and that is *irregular intermenstrual bleeding*. So important is this, that whenever such a complaint is made, a full and careful investigation is imperative. If the patient is post-menopausal, such metrorrhagia will be more noticeable, but it must never be lightly dismissed. A differential diagnosis has to be made from other causes of irregular intermenstrual bleeding, such as erosion, innocent polypus, pedunculated submucous fibroid, placental polypus, incomplete abortion, the bleeding of the mid-menstrual period associated with ovulation, menopausal irregularities. But unless the diagnosis can be decisively established clinically, a pathological examination of the suspected lesion is essential. Characteristically, the irregular bleeding of cervical carcinoma is associated with minor trauma, such as examination, coitus, exertion, but this is not necessarily so.

Second in importance is the symptom of *offensive vaginal discharge*. Here again, there may be a number of causes, neglected pessaries or tampons, infection, deficient personal hygiene, but there is a certain characteristic odour in malignant cases which suggests carcinoma to the experienced observer. However, here again, unless some obvious cause for the offensive discharge is readily forthcoming, such as a forgotten foreign body in the vagina, a full examination with malignant disease in mind is essential. The discharge may be from secondary infection of the growth, but is, at times, due to a pyometra following partial obstruction of the cervical canal by the tumour with damming up of septic or necrotic material in the body of the uterus.

Finally, there is the symptom of *pain*. It is a tragedy that, speaking generally, pain is a late symptom in all varieties of malignant disease. Pain obtrudes itself persistently and obstinately on the notice of the patient, but in the case of the cervix, as in other forms, usually implies extension of the growth to adjacent structures. Involvement of the bladder, rectum and obturator nerves means extensive spread and a gloomy prognosis. Pain may be the first symptom, and is felt in the adjacent organs, the sacrum or down the inner side of the thighs.

Any one of these three outstanding symptoms may appear alone or, alternatively, their order may be reversed, but the sequence, bleeding, discharge, pain, is the common one, so the paramount importance of irregular vaginal bleeding cannot be too much stressed.

SIGNS

The signs of carcinoma of the cervix are elicited by careful vaginal examination, including the passage of a speculum. The late stages of the disease are comparatively easy; an excavating ulcer, hard yet friable, or a proliferating growth which

bleeds readily on touch, are unmistakable. The early stage is more difficult; a patch of velvety softness on a hard base, especially if the glove is blood stained, is suggestive, and unlike the generalized softness of an erosion. It may be added that touch is more sensitive than sight in distinguishing between an early carcinoma and an erosion. It cannot be too often stressed that when any doubt exists, a wedge should be examined microscopically. A polypus should similarly be submitted to the pathologist, together with curetted material from the cervical canal.

As has already been indicated, the endocervical growth may pass unidentified unless the possibility of an adenocarcinoma is borne in mind. At times, the examiner feels a firm ring which just admits the tip of the finger; this simulates a patulous os, but the free infravaginal cervix is not felt. This condition is brought about by the infiltration of the vaginal vault and upper walls by the growth, the lower margin of which is palpated. The cervix, largely destroyed by carcinoma, is enclosed by this cuff of indurated vagina.

Schuller's test in the diagnosis has with experience proved useless. The signs therefore depend on bimanual examination, inspection per speculum, biopsy and curettage, and vary with the type of growth, but any lesion of the cervix which bleeds readily on examination is suspect.

DIFFERENTIAL DIAGNOSIS

As indicated above, the differential diagnosis is from other conditions which cause irregular vaginal bleeding and discharge. Simple cervical polypus and erosion are the commonest and most important, ulcerated fibromyomas, whether cervical or submucous, the products of conception, or neglected foreign bodies irritating the vaginal wall, may produce similar symptoms. The infection of the cervix both acute and chronic can prove confusing, the former with an ectocervical, the latter with an endocervical carcinoma.

The blood-stained discharge of carcinoma of the fundus is less likely to obscure the issue, since the cervix is typically normal for the age of the patient.

The routine examination of the patient by the four methods indicated will determine the diagnosis, and the acid test of the microscope is indispensable when any doubt exists.

SPREAD OF THE DISEASE

Carcinoma of the cervix spreads primarily by direct infiltration of adjacent structures, the vaginal vault and walls, the bases of the broad ligaments, the bladder and rectum. The spread is also lymphatic. The gland at the bifurcation of the common iliac artery is usually first invaded, spread to more remote glands, inguinal, femoral, lumbar, follows later. Secondary deposits are comparatively uncommon, death precedes them or, if they are discovered, the condition is too far advanced for any but palliative treatment.

CAUSES OF DEATH

Untreated, the average duration of the disease is eighteen to twenty months if the disease recurs after treatment this period is shorter.

Death may be due to several causes, but uræmia from involvement of the ureters where they cross the uterine arteries close to the supravaginal cervix is important, particularly so in the case of unsuccessful treatment.

Hæmorrhage, when the growth invades and opens the uterine arteries, is a common cause of death.

In some cases the patient succumbs to cachexia, anæmia and septic absorption, and in others to an ascending urinary infection, when the bladder is involved.

INTERNATIONAL CLASSIFICATION

Before discussing the treatment of carcinoma of the cervix, reference must be made to the international classification of the extent of the disease, since, naturally, treatment depends on the localization or spread of the growth, as well as on the general physical condition of the patient. Four stages are defined —

- (1) The growth is confined to the cervix and the uterus is freely moveable
- (2) The growth involves the vaginal fornices, but some mobility of the uterus remains
- (3) The growth has spread to the parametrium and/or the vagina, limiting movement of the uterus, and there are metastases in the pelvic glands
- (4) There is extensive spread to the parametrium and vagina, the bladder and rectum are involved.

TREATMENT

The two principal methods of treatment in carcinoma of the cervix are operation and irradiation. Both have advantages and disadvantages, but in the first place the decision must rest on the condition of the patient and the extent of the growth.

The operation is that described as Wertheim's hysterectomy, and implies the removal, by the abdominal route, of the entire uterus, the appendages on both sides, the broad ligaments, the parametrium, the glands in the broad ligaments and on the iliac artery and, most important of all, a cuff of vagina which gives enough healthy vaginal wall completely to cover the neoplasm and fold over it.

Irradiation can be carried out by the use of repeated applications of radium at intervals by intracervical and vaginal applicators, using the Stockholm technique, or by continuous application of the radium into the canal and into the vagina, i.e., the Paris method. Whether surgery or irradiation be employed in the first instance, deep X-ray therapy will be used to finish the treatment.

In the late case, with extensive local spread, involvement of the bladder or rectum, or with distant metastases, neither can be used, and attention can only be focused on minimizing the discomfort of the patient.

Good nursing and scrupulous attention to personal hygiene alleviate the symptoms, and sedatives for the relief of pain should be employed freely. Aspirin, phenacetin, the barbiturates, opium and morphine can be administered as required, and analgesics must never be withheld. In some cases, particularly when symptoms are due to recurrence, incontinence from a vesical or ureteric fistula is the greatest source of distress. In a few instances it is justifiable to consider transplantation of the ureters into the colon should the general condition permit, and the patient be prepared to submit to operation as a palliative measure.

Recent research has been directed towards the cancer-retarding qualities of sex-stimulating hormones of the opposite sex (Emge, 1942). These substances may prove to have an important part to play in the treatment of carcinoma, but much more work will have to be undertaken before an authoritative pronouncement can be made as to their use. There is some evidence that oestrogenic substances accelerate the growth of cancer in the genital tract in women. It may be possible to use male sex hormones to retard growth in the female.

RADIUM OR OPERATION

There is general agreement that operation can only be considered in those cases in which the malignant process remains limited to the cervix and the uterus is freely moveable, that is, cases which fall into stage 1 of the international classification. Cases in stage 2 might be so considered in the hands of the most proficient operators but, for practical purposes, patients who when first seen are found to be in stages 2, 3 or 4 are not suitable for surgical measures.

It has been stated that it is possible to operate on 60 per cent of women when first diagnosed, that approximately 40 per cent of those so treated are free of the disease five years later, and that 10 per cent of recurrences show themselves between the fifth and tenth year after operation. These figures are similar to those obtained in patients, also in this stage, who are treated from the first by radium.

For the more advanced cases, stages 2, 3 and 4, radium should be used unless there is some contraindication.

This is not the place to go into the details of the technique of either operation or application of radium, but it is of first importance that whichever method is adopted it should be in the hands of surgeons experienced in the method of choice. If good results are to be obtained the cooperation of the fully trained team—surgeon, physicist, pathologist, nurse—is essential.

The tendency on the part of the lay public to regard the application of radium as the lesser procedure must be sternly checked, that way disaster lies—the disaster of inadequate treatment, of accidents in the application and of its use in unsuitable cases. Radium has, however, this advantage, that it can be considered for patients in whom growth is too extensive for adequate extirpation by surgical measures, and in women whose general physical condition precludes a major operation.

THE EARLY CASE—In the patient who presents herself and is diagnosed with the carcinoma still localized to the cervix and the uterus freely mobile, a decision has to be taken as to the best form of treatment, operation or irradiation for that individual. It is assumed for purposes of discussion that both forms of treatment are available and in equally skilled hands, when it is not so, the decision is of course largely made by circumstances. Each form of treatment has its protagonists—

In favour of surgery, it can be said that—

- (1) The neoplasm, in the suitable case, is completely removed with a margin of healthy tissue
- (2) During the operation the glands on the iliac artery and in the broad ligament are removed

(3) That the end-results are at least as good as those obtained by irradiation.

Against operative measure, it is argued —

- (1) That the immediate mortality of the procedure is much higher than with irradiation, with radium the immediate mortality is under 1 per cent. With surgery the figures vary considerably but an immediate mortality of 5 per cent is probably a low figure
- (2) That operation involves more discomfort to the patient and a long period of inactivity
- (3) That in only a very few hands can the end-results, if the immediate mortality is taken into account, be comparable to those of radium
- (4) That in many patients the general condition precludes operation

The arguments in favour of the use of radium are, obviously, the converse of those given above

In favour of radium it is said —

- (1) Provided the growth is localized the whole of the malignant tissue is fully irradiated
- (2) The immediate mortality is low, under 1 per cent, and the end-results are as good, if not better, than those obtained by surgery.
- (3) That the discomfort and disability of the patient at the time are less
- (4) That it can be used in patients whose general condition makes them unsuitable for operation

Against irradiation it is argued —

- (1) That as the intensity of the emanation varies inversely as the square of the distance, the effective rays do not reach the glands of the pelvis. The obvious reply is that when those glands are already involved the case is no longer an early one and should not have been classified as stage 1.
- (2) That radium is contraindicated by certain well-defined conditions which are sometimes present even in an early case, such as a low hæmoglobin, a white blood cell count under 6,000, by the presence of an irritative cystitis or proctitis, by personal idiosyncrasy

On balance it would seem that even in the early localized type the patient should be advised to accept treatment by radium, since the end-results are at least as good as those obtained by surgery, and the immediate mortality is substantially lower

CASES IN STAGES 2 AND 3 — Here radium is the treatment of election, offers a better chance of cure to the patient once the growth has spread so that complete surgical extirpation is a matter of doubt or impossibility. Radium would be contraindicated by certain conditions, the chief of which are —

- (1) *Anæmia* The patient should have a hæmoglobin of at least 60 per cent. before the application is made
- (2) *Leucopenia* The white blood cell count must be within normal limits, as irradiation induces a leucopenia
- (3) *Acute cystitis or proctitis* Both of these would be aggravated by the presence of radium in the vagina.
- (4) *Pelvic sepsis*, other than the surface infection of the growth
- (5) *Fistula*, communicating either with the bladder or the rectum
- (6) *Distant metastases*
- (7) *Personal idiosyncrasy*

Some of these contraindications can be removed. Transfusion will improve the blood picture and facilitate the treatment. Infections of the bladder and rectum, provided they are not due to the malignant process, will respond to local measures.

Pelvic sepsis must be cleared before the radium is inserted, with the single exception of pyometra. Here dilatation of the cervix with release of the pus and washing out of the uterus can immediately precede the application.

COMPLICATIONS OF TREATMENT

As in any grave condition, certain risks of treatment have to be accepted. Operative complications are well recognized, though fortunately of relatively rare occurrence; hæmorrhage, obstruction, peritonitis, or injury to ureters are obvious examples.

The risks of radium treatment are perhaps less well recognized, and here too complications are infrequent in experienced hands. Hæmorrhage is rare, but anæmia from the effect of the rays on the blood is not uncommon; burns may damage the vaginal walls and even cause fistulæ. As a later complication, a irritating watery vaginal discharge may be distressing to the patient, although not necessarily of grave significance.

SUMMARY

Carcinoma of the cervix is most common in parous women of the age period forty-five to fifty-five.

The three outstanding symptoms are irregular vaginal bleeding, offensive discharge, and pain in the sacral region and down the inner sides of the thighs.

The diagnosis is made by careful vaginal examination, bimanually and per speculum, supplemented by biopsy and a pathological opinion when any doubt exists.

Routine pelvic examination in parous women is increasingly advocated.

Treatment depends on the stage of the disease.

For stages 2, 3 and 4 radium is used unless contraindicated.

For stage 1 the choice lies between radical operation and irradiation, and on the whole the use of radium should be preferred.

Only in cases diagnosed and treated early is the prognosis hopeful.

In conclusion, quotation is made from the report of the Cancer Research Committee of the Medical Women's Federation, published in 1926, but still a regrettably true to-day —

"The great obstacle to success in the treatment of cancer of the uterus by any means is lateness in diagnosis. The majority of patients suffering from cancer of the cervix are not referred for radium therapy until the disease is far advanced. The average duration of symptoms in our cases was ten months. The majority of these patients did not consult a physician until the disease was far advanced, but in more than 25 per cent the average time elapsing before an examination was made was seven months. It cannot be too often emphasized that intermenstrual bleeding, or abnormal vaginal discharge, notice near the age of the menopause, bleeding of any character or vaginal discharge after the menopause practically always indicate pelvic cancer. About one quarter of the patients complained of pain as an early symptom."

Reference

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OVARIAN TUMOURS

BY STANLEY WAY, M.R.C.S., M.R.C.O.G.

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It is not possible in the short space of this article to deal in an exhaustive manner with this long, complex and important subject. It is therefore necessary to confine it mainly to the important aspects of the commoner ovarian tumours, mentioning the rarer tumours and such things as operative technique only when these are of special importance. Naturally the emphasis will be on the clinical and practical aspects rather than on the pathological and theoretical.

GENERAL CONSIDERATIONS

Before considering any special tumours it is necessary to have clearly in mind a conception of the subject as a whole. Ovarian tumours are by no means rare, thus in the last five years at Newcastle 2 per cent of patients admitted to the gynaecological ward were suffering from ovarian tumours. In all, some 450 cases have been seen. Ovarian tumours are no respecter of age. I have seen one in a child of four-and-a-half months, and one in a woman of ninety, but for the most part they are rare before the age of twenty and after seventy, the greatest number in the Newcastle series in one decade being between the ages of forty-one and fifty. Actually 75 per cent occur between the ages of twenty-one and sixty. At least a quarter of all ovarian tumours are malignant. If the fact is borne in mind that the prognosis in cases of malignant ovarian tumours is bad, even after apparently complete removal, whereas in benign cases a complete cure can be achieved, the wisdom of the time-old teaching that every ovarian tumour should be removed as soon as diagnosed becomes apparent.

The next most important consideration is the complexity of the normal ovary, both anatomically and physiologically. The ovary is apt to be regarded as a piece of tissue lying in the pelvis shooting out an ovum every month for nearly forty years, and then returning to the oblivion whence it came. No conception could be more dangerous from the clinicians' point of view. Its anatomical complexity is made necessary by its complex physiology, and this explains the great variety of tumours which the ovary can produce. Its constant functional restlessness and its relationship with other parts of the body may explain its readiness to produce tumours. In the future, if more knowledge is to be gained concerning these tumours, the lethargic attitude to ovarian function, which has perhaps been brought about in no small measure by the commercialization of the ovary of the hen, must be abandoned.

SIGNS AND SYMPTOMS

Abdominal swelling—This is the most constant sign. Naturally it depends on the size and to some extent the situation of the tumour, and it is the commonest reason for seeking advice. It is usually slow in developing but may be quite sudden, especially with malignant tumours. The swelling is more often inclined to one side of the abdomen, but it may lie in the midline. These characteristics help to differentiate it from other abdominal swellings. The history of the swelling is

often more than a year, thus being longer than that of a full-term pregnancy. The eccentricity of the tumour is not often found in uterine tumours or in a full bladder. Its usual smoothness is unlike a mass of fibroids, and percussion with resonance in the flanks and dullness over the tumour serves to differentiate it from ascites or a mass of distended bowel.

Pain of some degree is more common than is usually thought. It is said to signify malignancy, torsion or rupture, but many uncomplicated and simple tumours are associated with pain of some degree. It is therefore essential when a woman complains of lower abdominal pain, even if there is no swelling, to make a pelvic examination to exclude ovarian tumour.

Loss of weight—This is often apparent and is common in malignant tumours but rare in benign ones. If it is not apparent it is a valueless sign unless the patient can produce an accurate weight chart, which she seldom can.

Urinary symptoms—These exist in about a quarter of the cases but they may be due to other causes. Frequency is the most common. Retention occurs only when the cyst or a loculus of it becomes impacted in the pelvis.

Alimentary symptoms—Vomiting is seen occasionally with uncomplicated tumours. When torsion occurs it is a common sign. Constipation may be met with in large malignant tumours.

Menstrual disturbances—These are uncommon in cases of ovarian tumours, thus helping to differentiate them from fibroids, when menorrhagia predominates, and pregnancy, when amenorrhœa is the rule.

Dysmenorrhœa—This is not common, but may be met with in cases of ovarian dermoids.

TYPES OF OVARIAN TUMOUR

BENIGN TUMOURS—*Pseudomucinous cystadenoma*—This is the most common of all ovarian tumours and may reach an enormous size. I have removed one weighing more than three stone. They are particularly symptomless, usually giving rise to a swelling only. They are most common between the ages of thirty and sixty and are usually unilateral.

Papillomatous cystadenomas resemble the former but contain actively growing papillomas. These may invade the cyst wall and cause rupture or local implantation. They are regarded by some authors as potentially malignant. In some the papillomatous development is intracystic and in others extracystic. The latter are easily recognizable at operation.

Dermoids are among the more common tumours arising from the ovary. They may be found at any age but are common in young women. They are usually unilateral and, according to some authorities, arise more commonly from the right than from the left ovary. In my own series there were forty cases. In only two was the tumour bilateral, whilst in the remainder more arose from the right than from the left ovary, but the series is too small for an accurate observation.

They are most interesting tumours and their contents are well known. Sebaceous material is always present, hair and teeth commonly. Any tissue can be found and I have seen an almost complete cerebellum present in one of these tumours. They do not as a rule grow much larger than a grapefruit and this fact is responsible for their liability to torsion. Pain is often present apart from torsion, and

have noted the frequency of dysmenorrhœa in these cases. Most small ovarian tumours lie behind the uterus. Dermoids frequently occupy the utero-vesical pouch, an occurrence common enough to be of diagnostic significance. Most of them feel semi-solid on examination and a skiagram may show the presence of teeth or bone. Malignant change may occur in dermoids. Stubler and Brandess (1924) claim that this occurs in 4.5 per cent. of ovarian dermoids.

Fibromas are the most common innocent connective tissue tumours of the ovary. They may be bilateral, and are often associated with ascites.

Meig's syndrome—This is seen in cases of ovarian fibroma. In this particular syndrome the tumours are associated with ascites and hydrothorax. Its importance is that the tumours are benign and may be mistaken for advanced malignant tumours with secondaries and unless recognized these patients may be condemned to years of suffering, whereas after removal the effusions clear up spontaneously. It was given the name Meig's syndrome because it was brought into prominence by Meig (1939). In actual fact it was first noticed some fifty years previously by Lawson Tait.

MALIGNANT TUMOURS—The frequency of secondary carcinoma in the ovary is often stressed, and whilst this remains true of post-mortem material it must be remembered that from the clinicians' point of view nearly 80 per cent. of the tumours seen are primary ovarian.

Malignant epithelial tumours—Those most commonly seen are malignant papillomatous tumours, malignant pseudomucinous tumours, and more rarely solid carcinoma. These tumours present much the same symptoms as the benign ones, with three important exceptions, namely, ascites is common and pain of a severe nature is an early symptom. Also fixity to surrounding structures and secondary nodules in the pouch of Douglas are important diagnostic signs. The growth of these tumours is usually slow and so long as the capsule is not invaded metastases usually do not occur. As soon as the capsule is invaded, local and finally general metastases rapidly occur. The solid ovarian carcinoma is highly malignant and often remains symptomless until long after it has become inoperable.

Metastatic carcinoma—Almost any malignant tumour in the body may metastasize to the ovary. There are two types, those which resemble the parent tumour, and Krukenburg tumours. These latter are secondary to gastric and colic carcinoma and do not histologically resemble the primary growth. Whenever a malignant ovarian tumour is removed it must be submitted for section and other common sites of carcinoma should be examined.

Malignant connective tissue tumours—These are rare and do not warrant special mention.

Rare ovarian tumours—Three most interesting tumours fall into this category—

- (i) Granulosa-cell tumours
- (ii) Dysgerminoma
- (iii) Arrhenoblastoma

The first should be regarded as malignant. It produces a feminizing hormone and may give rise to precocious sexual development, or menstruation in the aged.

The second may behave as a benign tumour or may show excessive malignancy. It does not produce any hormones.

The third is rare and has a masculinizing effect on its host.

TREATMENT

The treatment of all ovarian tumours is surgical. The operation of ovariectomy first performed by MacDowell in America in 1809, and perfected by Spence Wells at the Samaritan Hospital, London, is now a commonplace occurrence in modern gynaecological practice, so commonplace in fact that people have ceased to think about it and fail to realize that it may be unnecessary. To Bonney, more than to any one, surgery owes a most important modification of this operation when applied to benign tumours, for it was he who taught the value of partial ovarian resection in young women. Unfortunately large numbers of gynaecologists have paid no heed to his teaching. Two cases will illustrate its value—

(1) A young woman, doctor aged twenty-five, suffered for some years from osteoarthritis of the hip. One night she was seized with pain in the right iliac fossa, and was admitted to hospital with a diagnosis of appendicitis. Laparotomy was performed by a general surgeon who found a twisted right ovarian dermoid. This he removed. He examined the other ovary and found another dermoid and removed that also. Within two months of the operation the most severe menopausal symptoms occurred and her arthritis increased in intensity. This woman was left in a most unfortunate state, all the more so as she was at that time engaged to be married.

(2) This patient was a married woman aged thirty-five. An ovarian cyst was discovered at a welfare centre but the antenatal officer failed to realize its importance. The patient was allowed to go to term and had a breech delivery of a still-born baby in which the tumour caused some trouble. Six months later I saw her and operated for removal of five dermoids from her right ovary and three from the left, leaving her with two normal ovaries. She menstruated normally after the operation and recently had a normal delivery of a living child.

Recently I resected a multilocular cystadenoma weighing ten pounds from the right ovary of a girl of twenty, and on another occasion I resected a cyst from each ovary and performed a multiple myomectomy at the same time on a young woman who subsequently became pregnant.

Care must be taken not to damage the cyst on removal and its histology must be determined. I would rather resect a malignant tumour and have to perform a secondary operation than waste any part of a young woman's ovary, even if the disease is unilateral. Fortunately the number of malignant tumours in young women which cannot be recognized at operation is excessively small.

The treatment of malignant tumours is a different story. Removal of both ovaries and uterus is indicated. If secondaries are present the main mass should be removed for the patient's comfort, and it is here that X-rays are of great use. As a sole means of treatment deep X-ray therapy is occasionally useful as a palliative, but these tumours are not usually highly radio-sensitive and the dosage falls off rapidly as the rays penetrate towards the centre. In consequence, the results of this treatment are not often encouraging. Radium plays no part in the treatment of carcinoma of the ovary.

COMPLICATIONS

Apart from malignant degeneration there are three complications of importance—torsion, infection and rupture.

Torsion is the most common complication. Its symptoms are usually described as sudden, severe pain in the abdomen, vomiting and nausea, all of which pass off and leave a localized tenderness over the tumour. In actual fact these are the symptoms of torsion with infarction. In every case I have seen these symptoms have been preceded by mild attacks of pain, occasionally with vomiting; these are the symptoms of torsion without infarction. In the case of a young woman, I now

regard it as absolutely imperative to operate before infarction takes place so that the ovary and tube may be conserved, and if these early symptoms are neglected infarction of the ovary may become inevitable. It is stated in many books that resection cannot be carried out if a cyst is twisted. This is quite untrue. I have several times untwisted a cyst and resected the tumour leaving the ovary. In most infarcted tumours the ovary cannot be saved, but I have recently applied to two cases the principles applied to the resection of bowel in a strangulated hernia. Untwist the tumour, apply hot towels and watch the effect. The distal part of the tube is a good guide. If it becomes pink resection can be carried out. If it remains almost black then it cannot. If adhesions are present then the infarction is long standing and resection is impossible.

Infection is not commonly seen. When it is present there is abdominal pain, tenderness over the tumour and a high temperature. Removal with drainage is indicated.

Rupture is most often spontaneous, due to perforation of the cyst wall by apillomas, but it is sometimes traumatic as a result of a blow or fall. Removal is indicated.

OVARIAN TUMOURS IN PREGNANCY

These are not common. Small tumours are very liable to torsion in the puerperium, and it is likely that the sudden return of the uterus to the pelvis may initiate the movements of the pedicle which lead to torsion. I believe that removal of these cysts should be undertaken early in the puerperium.

In general, the treatment does not vary in the pregnant from that in the non-pregnant, except that operation should preferably not be performed in the first three months of pregnancy, owing to the risk of abortion, and in the latter weeks of pregnancy the patient should be taken as near to term as possible.

Tumours obstructing labour—If such tumours have to be dealt with in remote areas and rupture of the uterus is imminent, if cystic they should be tapped through the posterior fornix, but this is bad treatment. The obvious thing is to remove the tumour, and in this case I cannot emphasize strongly enough how thoroughly unjustifiable it is to perform a Cæsarean section first or to do it just because the abdomen is open. If the tumour cannot be brought out or is solid, the pregnant uterus must be everted. After removal, close the abdomen and deliver the patient with forceps at full dilatation to prevent undue strain on the incision.

I have only once performed a Cæsarean section in such a case. The ovary was very close to the uterus and after removal there was free hæmorrhage which I could not control with sutures. I performed a lower segment operation and the retraction of the uterus immediately stopped the bleeding.

Partial resection is quite possible in pregnancy and I have twice done it on patients in labour.

CONCLUSION

I would plead again for a reconsideration of the usual attitude to ovarian surgery in the young and, when possible, one of conservatism should be adopted. Finally, I would recommend the history of ovarian surgery as set out in the Spencer Wells Lectures (1878). A more interesting narrative has not been written.

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THE COMPLICATIONS OF GALL-STONES

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THE incidence of many surgical conditions appears to be diminishing. The acute intussusception is much less common now that child welfare centres are disseminating knowledge regarding the feeding of babies. Again, carcinoma of the tongue occurs less frequently now that three of the exciting causes of chronic superficial glossitis, i.e., "syphilis, sepsis and spirits," operate to a dwindling degree. Furthermore, oral cleanliness and more rigid medical regime in the prodromal stages have greatly reduced the number of peptic ulcers. Gall-stones, however, still occur frequently, and are possibly becoming even more common, as younger patients seem to be afflicted more often than was the case thirty years ago. Barrington-Ward has recorded three personal cases in children under ten years of age.

DIAGNOSIS

Space forbids a detailed description of the symptomatology of gall-stones. Typically the patient is "forty to fifty, fat, flatulent, and fertile." Distension after meals is perhaps the most constant symptom, and is often associated with pain in the region of the angle of the right scapula.

In this country a straight X-ray photograph reveals about 15 per cent. of gall-stones. In American clinics double this number are discovered by this means, possibly owing to refinement of technique, or else because American stones have a higher calcium content. A cholecystogram is often misleading. The gall-bladder may not fill owing to lack of absorption of dye from the bowel, impaired liver function, a stone in the cystic duct which prevents dye from entering the gall-bladder or, occasionally, the gall-bladder may be contracted. Not infrequently the cholecystogram appears to be normal when several small stones are present, which are not large enough to give rise to a "filling defect." In these cases a diagnosis must be made on clinical grounds. A history of severe and sudden pain followed by jaundice is almost certainly associated with the passage of small stones along the common bile duct, and in such cases exploration should be urged.

The complications of gall-stones can be considered conveniently under the following headings —

INFLAMMATORY COMPLICATIONS

(1) *Gall-bladder* — Acute cholecystitis is sometimes the first indication of cholelithiasis, although acute inflammation occasionally occurs before sufficient time has elapsed to permit of the formation of stones. Typically, the patient is seized with sudden severe pain in the right hypochondrium, associated with a temperature of somewhat over 100° F. Local rigidity, possibly vomiting, and pain referred to the right shoulder complete the picture.

Acute cholecystitis is a condition which always gives rise to some degree of anxiety. Out of 107 consecutive cases reviewed by me, the mortality was 13 per cent. These included 38 subjected to immediate operation with a mortality of 21 per cent. Of the patients treated on expectant lines the mortality was 9 per cent.

(McNeill Love, 1929) Most surgeons now treat acute inflammation of the gall-bladder by expectant measures, so the latter figure is more in accordance with present-day statistics

The advantages of successful expectant treatment are not only a lower mortality, but when the acute phase has subsided a cholecystectomy can usually be performed with reasonable safety; whereas in the case of an acutely inflamed gall-bladder mere cholecystostomy may be the only wise procedure

(2) *Pancreas*—The incidence of acute pancreatitis is about one case in every 3,000 surgical emergencies (Chamberlain, 1927) Until recent years the diagnosis of this condition was unusual before the abdomen was explored on the operating table More careful attention to clinical features now results in accurate diagnosis in the majority of cases The sudden onset, continuous vomiting, and cyanosis are all suggestive As with perforation of an ulcer, marked prostration is also present As Moynihan pointed out, "shock" is an incorrect term to apply to this condition, as it is not associated with marked diminution of the blood pressure

Abdominal rigidity varies inversely to the degree of prostration, and therefore is absent for a variable time after the onset of infection, i.e., during the period when prostration is still profound

About 50 per cent. of cases of acute pancreatitis are associated with gall-stones

Occasionally, a gall-stone becomes impacted in the duodenal ampulla, which obstructs the opening of the pancreatic duct and allows infected bile to regurgitate into the gland. When no such obstruction is present it is assumed that gall-stones in the biliary passages initiate a reflex spasm of the sphincter (muscle of Oddi) at the duodenal ampulla, and as a result retained bile regurgitates along the pancreatic ducts A careful history will elicit the fact that most cases of acute pancreatitis have previously suffered from similar but less severe attacks, and this is often an important point in diagnosis

Formerly the treatment of acute pancreatitis was by laparotomy, with drainage of the gall-bladder, peritoneum, and/or the pancreatic region. The advantage to be gained by operation is that a cholecystectomy (or drainage of the common bile duct if the gall-bladder is contracted or inaccessible) decompresses the biliary passages and discourages further regurgitation of bile into the pancreatic ducts However, the mortality associated with operative interference is about 40 per cent This depressing figure has led many surgeons to withhold immediate operation in cases which can be diagnosed with reasonable confidence Small doses of morphine, an electric pillow on the epigastrium, and continuous intravenous saline and glucose are important factors in expectant treatment It is found that, in spite of the intense intraperitoneal reaction, in the majority of cases the symptoms subside, or a localized abscess is formed which can in due course be safely evacuated Subsequently the biliary passages are investigated radiologically, and pathological conditions are subjected to surgical scrutiny If no pathological condition is discovered then a regime is prescribed which combats pancreatic insufficiency A low-fat diet and some pancreatic preparation (such as solution of pancreatin B P C, pancrobilin, panteric) are indicated. In this connexion the fact must be stressed that after cholecystectomy for gall-stones, chronic pancreatitis and resulting deficiency may persist, and dyspeptic symptoms still affect the

patient, whose radiant hopes of a cure after the operation are thereby sadly damped. I have already alluded to this sequel to operations for gall-stones, which does not seem to be realized as generally as the condition merits (McNeill Love, 1933).

Case report—A few years ago I removed a chronically inflamed gall-bladder, containing stones, from the mother of a medical friend. At the post-operative chat I told him that all other organs were apparently healthy, but in such cases some degree of chronic pancreatitis commonly existed, and it would be wise to prescribe some pancreatic preparation for the patient for a few months in order to combat pancreatic deficiency. The patient made a good recovery, but about a month later the son telephoned me to say that his mother was fairly well, but still troubled with flatulence, dyspepsia and abdominal discomfort. I commiserated, and after a moment's reflection, inquired as to what pancreatic preparation he had prescribed. After a pause, an agitated voice confessed that he had entirely forgotten all about it! (As the patient was the relative of a medical man I was not altogether surprised. A suitable preparation was prescribed forthwith, and the pancreatic symptoms abated within a few days.

A pancreatic regime can be interrupted after two or three months, continued if symptoms reappear, and usually terminated within a year of the operation by which time the gland has recovered sufficiently to function adequately.

(3) *Biliary passages*—Cholangitis is liable to occur as a result of temporary or intermittent obstruction of the common bile duct, such as is associated by passage or impaction of a calculus. Intermittent jaundice, so typical of an impacted calculus, is due to exacerbations of œdema in the wall of the duct adjacent to the stone, and not to any alleged "ball-valve" action.

Acute cholangitis is a serious, but fortunately uncommon, condition, and it is often associated with cholangiectasis. Clinically, the patient is obviously ill, rigors supervene and the liver is enlarged, firm and tender. Drainage of the common duct is urgently required, but only too often fatal cholœmia develops, and at post-mortem examination the liver is found to be distended with an ochre-coloured mixture of pus and bile.

Chronic cholangitis is a common accompaniment of prolonged cholelithiasis. Exacerbations of subacute infection, i.e., a "liver attack," are to be expected. These exacerbations are characterized by mental depression, slight rise of temperature, nausea, abdominal discomfort, and sometimes slight icterus. This syndrome was described by Charcot as "intermittent hepatic fever" (Brunschwig, 1942), and the old-fashioned but adequate treatment was a blue pill and a black draught.

BILIARY FISTULA

Gall-stones have been discharged by all the natural orifices. Ulceration from the fundus of the gall-bladder into the transverse colon may fortunately result in expulsion of the stone with the faeces. Occasionally a fistula forms between the stomach and gall-bladder, so that stones are vomited. Fistulae have been reported between the gall-bladder and the pelvis of the right kidney, with the result that stones were voided in the urine. A subphrenic abscess following local gangrene of the gall-bladder sometimes erodes the diaphragm and invades the lung, so that stones are expectorated. Finally, ulceration of the gall-bladder may allow stones to escape into the general peritoneal cavity, and migration into the pelvis results in the formation of a pelvic abscess, which ruptures into the vagina and, to the surprise of all concerned, stones are evacuated by this route.

In addition to discharge of stones via the natural passages, external fistulæ also occur, the most common site being at the umbilicus. All fistulæ are less common now than formerly, owing to the fact that stones are more readily detected, their dangers better understood, and consequently operation is more frequently performed.

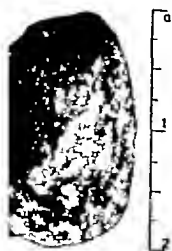


FIG 1

Gall-stone removed from the lower end of the ileum.

From the clinical standpoint, the most important fistula is one which opens into the duodenum from the neck of the gall-bladder. If the calculus is less than one inch in diameter it will probably travel safely along the alimentary canal and may escape detection in the fæces. Any larger stone will almost certainly be arrested in the bowel, usually about two feet above the ileo-cæcal valve (fig 1). This is one of the most dangerous varieties of acute intestinal obstruction, the salient features of which are pain, vomiting, distension and absolute constipation. As the obstruction is not complete, pain is not severe and distension is not marked until ileus supervenes. Also (as in the case of Richter's hernia) as the lumen of the bowel is not entirely occluded, absolute constipation is absent, i.e., a second enema given from half to one hour after the first, is returned with some fæcal material and perhaps little flatus. The above divergencies from the textbook description of acute obstruction are apt to encourage a practitioner to procrastinate, but the one symptom which should put him on his guard is persistent vomiting which is unrelieved by the usual measures. Furthermore, if a tape measure is passed beneath the patient and retained in position, measurement of the girth at the level of the umbilicus can be charted accurately every hour, without disturbance to the patient. This is much more satisfactory than a visual estimate, which is apt to be misled by variation of contour. In cases of gall-stone obstruction a slow but steady increase in girth is usually measurable.

Obstruction of the ileum by a gall-stone occurs, as a rule, in old people. Whereas acute obstruction arising from a carcinoma of the colon is most common between the ages of sixty and seventy years, gall-stone obstruction occurs most frequently in the seventies or even eighties. The last three cases under my care were seventy-nine, eighty-three and seventy-seven respectively. If an old person vomits persistently for more than six hours for no obvious reason, gall-stone obstruction should be borne in mind.

One further point concerning diagnosis is relevant. The practitioner has probably been treating the patient, perhaps for many years, for recurrent attacks of "indigestion, wind, biliousness or spasms," which were in reality attacks of subacute cholecystitis. When obstruction supervenes, the practitioner visits the patient with the preformed diagnosis that this is a similar attack, which will subside as on previous occasions. Therefore he recommends the usual remedies, and at his next visit the following day is startled to find the patient obviously ill and vomiting copiously.

The prognosis of this condition is gloomy. The age of the patient, delay in diagnosis, exhaustion, dehydration and saline depletion, as a result of prolonged vomiting, all help to weight the scales against recovery.

In a small minority of patients the gall-stone is palpable as a hard and mobile lump, either in the right iliac fossa or in the pelvis

If the condition is reasonably suspected the abdomen is opened, light general or local anaesthesia being adequate. When located, the stone is milked upwards for a few inches and removed through a longitudinal anti-mesenteric incision which is sutured transversely so as to avoid the possibility of a stricture. Intravenous infusion of saline and glucose, and small doses of omnopon, may help to tide the patient over the critical three days following the operation

OBSTRUCTION TO BILIARY PASSAGES (FIG 2)

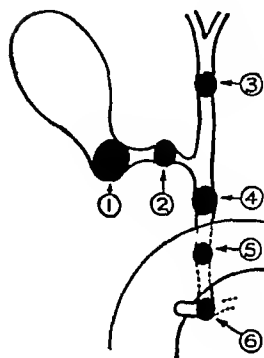


FIG 2

Usual sites of impaction of biliary calculi: (1) In Hartmann's pouch (2) In the cystic duct (3) In the common hepatic duct (4) In the supraduodenal portion of the common duct (5) In the retroduodenal portion of the common duct (6) In the ampulla of Vater

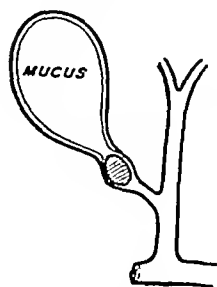


FIG 3

Mucocele of the gall-bladder

Gall-stones may become impacted in the cystic duct (including Hartmann's pouch), the common bile duct or at the ampulla of Vater. This latter condition has already been considered

Impaction of a stone in the cystic duct prevents escape of mucus from the gall-bladder, which gradually distends (unless completely fibrosed) until it accommodates a pint or more of mucus (fig 3). Clinically, a firm pyriform swelling is palpable, which is continuous with the liver, moves with respiration, and is often surprisingly painless. Infection is apt to supervene, with exacerbations of temperature and tenderness, which denote the conversion of the mucocele into an empyema of the gall-bladder. A cholecystogram indicates that the gall-bladder does not fill, which is not surprising, as the cystic duct is plugged by a calculus.

Treatment consists in exposure of the gall-bladder which is then aspirated in order to reduce its size and facilitate examination of the biliary passages. Cholecystectomy usually presents no difficulties.

Obstruction of the common bile duct following impaction of a calculus is a condition which frequently gives rise to considerable anxiety. Typically, the patient develops jaundice a day or so after an attack of pain. Previous attacks may have occurred and subsided, owing to the calculus having either slipped back into the gall-bladder or safely negotiated the biliary passages. However, if impaction occurs the jaundice deepens and becomes intermittent, owing to variations in the intensity of oedema in the duct around the stone. Stools and urine vary in colour according to the amount of bile which seeps past the stone. Owing to previous fibrosis the gall-bladder does not distend, and in the large majority of cases Courvoisier's

law holds true, i.e., jaundice associated with an enlarged gall-bladder is not due to gall-stones.

For a time expectant measures are adopted in the hope that the stone will eventu-

lly either slip back or pass on. Saline aperients, glucose, moderate doses of urotropine or felamine (which contains cholic acid and urotropine) to discourage infection in the biliary passages, and belladonna to relax spasm, are useful measures. Vitamin K is prescribed in order to lessen bleeding should operation be necessary while the patient is still jaundiced. If unsuccessful, a nice judgement is required in order to decide the optimum time for operation. A reasonable time should be given in the hope that the stone will dislodge, but undue delay engenders increasing cholangitis, and even cholangiectasis, with ever increasing risk of cholæmia.

An average time of waiting is about two weeks, but increasing jaundice and cholæmic symptoms, such as drowsiness, anorexia and vomiting, will precipitate the operation. On the other hand, temporary improvements and but little deterioration of the patient's health may justify waiting in hope for a longer period.

The operation, which is essentially a decompression of the biliary passages, must be well within the patient's physical capacity. In toxic and cholæmic patients, particularly if obesity adds to the technical difficulty, mere drainage of the gall-bladder or common bile duct is all that should be attempted. For some days "white bile" escapes from the tube, a certain sign of serious liver damage. Pigment is then excreted in increasing amount, jaundice begins to disappear, and the general condition of the patient improves. At a later date exploration can be undertaken with reasonable safety, and the stone can either be milked up to the opening in the common duct, pushed down into the duodenum, or removed from the duct through a separate incision, or possibly transduodenally.

Whether the gall-bladder is removed at this or a subsequent operation, depends on the general condition of the patient and the technical difficulties concerned with the cholecystectomy in question.

Less severe cases can be treated by removal of the stone at the initial operation, drainage of the common duct, and cholecystectomy either at the same operation or a subsequent one.

NEW GROWTHS

Adenomas of the gall-bladder are found in about 2 per cent of cases of cholelithiasis. An adenoma occurs as an umbilicated tumour at or near the fundus of the organ. As it does not appear to give rise to symptoms or undergo any secondary changes it is merely of academic interest.

Carcinoma of the gall-bladder is almost invariably associated with calculi, and it is stated that carcinoma occurs in 5 per cent of gall-stone cases. This connexion provides convincing support for the theory that carcinoma is often inaugurated by chronic irritation. The tumour is usually spheroidal-celled but, owing to prolonged irritation and consequent metaplasia, the growth may become squamous-celled. The condition occurs insidiously and is usually discovered at operation. More advanced cases are sometimes suspected or diagnosed clinically, in that an irregular and firm mass is palpable in the gall-bladder area. If the neoplasm is confined to the gall-bladder, cholecystectomy offers a reasonable hope of cure. More commonly, infiltration of the liver has already occurred. If such infiltration appears to be localized, a wedge-resection with a diathermy knife should be attempted, but only too often the growth is found to have spread beyond the reach of surgical eradication.

In a small minority of patients the gall-stone is palpable as a hard and movable lump, either in the right iliac fossa or in the pelvis

If the condition is reasonably suspected the abdomen is opened, light general or local anæsthesia being adequate. When located, the stone is milked up for a few inches and removed through a longitudinal anti-mesenteric incision which is sutured transversely so as to avoid the possibility of a stricture. Intravenous infusion of saline and glucose, and small doses of omnopon, may help tide the patient over the critical three days following the operation

OBSTRUCTION TO BILIARY PASSAGES (FIG 2)

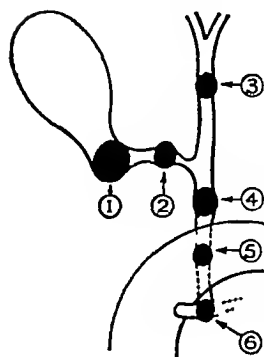


FIG 2

Usual sites of impaction of biliary calculi (1) In Hartmann's pouch (2) In the cystic duct (3) In the common hepatic duct (4) In the supraduodenal portion of the common duct (5) In the retro-duodenal portion of the common duct (6) In the ampulla of Vater

Gall-stones may become impacted in the cystic duct (including Hartmann's pouch), the common bile duct or the ampulla of Vater. This latter condition has already been considered.

Impaction of a stone in the cystic duct prevents escape of mucus from the gall-bladder, which gradually distends (unless completely fibrosed) until it accommodates a portion or more of mucus (fig 3). Clinically, a firm pyramidal swelling is palpable, which is continuous with the liver, moves with respiration, and is often surprisingly painful. Infection is apt to supervene, with exacerbations of temperature and tenderness, which denote the conversion of the mucocoele into an empyema of the gall-bladder. A cholecystogram indicates that the gall-bladder does not fill, which is not surprising, as the cystic duct is plugged by a calculus.

Treatment consists in exposure of the gall-bladder, which is then aspirated in order to reduce its size and facilitate examination of the biliary passages. Cholecystectomy usually presents no difficulties.

Obstruction of the common bile duct following impaction of a calculus is a condition which frequently gives rise to considerable anxiety. Typically, the patient develops jaundice a day or so after an attack of pain. Previous attacks may have occurred and subsided, owing to the calculus having either slipped back into the gall-bladder or safely negotiated the biliary passages. However, when impaction occurs the jaundice deepens and becomes intermittent, owing to variations in the intensity of oedema in the duct around the stone. Stools and urine vary in colour according to the amount of bile which seeps past the stone. Owing to previous fibrosis the gall-bladder does not distend, and in the large majority of cases Courvoisier's

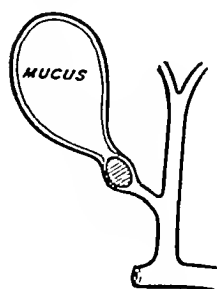


FIG 3

Mucocoele of the gall-bladder

law holds true, i.e., jaundice associated with an enlarged gall-bladder is not due to gall-stones.

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CONCLUSION

The numerous and formidable complications attributable to gall-stones indicate the importance of diagnosis and adequate treatment. Fortunately, the school which advocated palliative measures in suspected cases, unless some calamity occurred, is dwindling in numbers. Such measures as olive oil to "dissolve the stone," cholagogues to aid passage, and fat-free diet (a sop to the pancreas rather than to the gall-stone), have no place in the treatment of cholelithiasis. Such measures should only be prescribed if the patient is unsuited for operation, or so obese that the operative risk is appreciably increased. In obese subjects a three months' reducing course is a wise procedure which not only eases the surgeon's task, but improves the tone of the patient in general, and that of the myocardium in particular.

Operative details are beyond the scope of this article, but it should be mentioned that the modified cholecystectomy devised by Professor Thorek of Chicago is a definite advance in biliary surgery.

Briefly, the operation consists in identifying and ligaturing the cystic duct and artery. The gall-bladder is then opened and the contents evacuated. The lateral walls are excised so as to leave that part of the gall-bladder attached to the liver *in situ*. This strip is then coagulated by diathermy and covered with a detached portion of falciform ligament or omentum, and the abdomen can then be safely closed without drainage.

The advantages of this modification, as compared with the standard operation are —

(1) *Lower mortality*—about 2 per cent is the recognized mortality of the standard operation. Deaths are usually due to chest complications or pulmonary embolism. Diminished movement of the diaphragm, consequent on subphrenic irritation due to a puddle of bile and a drainage tube, encourages basal pulmonary atelectasis. Furthermore, reduction of the piston-like movement of the diaphragm, which is effective in maintaining the venous circulation, encourages venous stasis and consequent thrombosis, a precursor of pulmonary embolism.

Closure of a bile-free abdomen, without drainage, permits deep breathing and relative comfort as soon as the effects of the anæsthetic have subsided. Thorek publishes statistics, which show a mortality of 0.5 per cent, agreeing with the figures obtained by my colleague and myself after several years' experience of the operation (Bailey and McNeill Love, 1939).

(2) *Smoother and shorter convalescence*—Non-fatal chest complications, which are irksome for the patient and a worry to the surgeon, are far less common. Less pain and discomfort are experienced by the patient, who is also spared the removal of a slimy, bile-sodden dressing once or twice daily, also the time of the nursing staff is conserved if no dressings are required. In addition, the wound heals by first intention and a firm scar results, which is unweakened by any aperture necessitated by the introduction of a drainage tube.

The illustrations are from *A Short Practice of Surgery*, by H. Bailey and McNeill Love, by permission of Messrs. H. K. Lewis & Co., Ltd.

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SOME PRINCIPLES IN THE TREATMENT OF BURNS

By R H FRANKLIN, F R C S

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THE introduction of tannic acid treatment was a milestone in the management of burns, to-day the method has been largely abandoned and its place taken by a number of procedures. The result is that in many respects the treatment of burns is less satisfactory now than it was ten years ago. This is due to the conflicting advice which is given as to details and the neglect of first principles. It is unreasonable to expect that one method of treatment will suffice for all types of burn and scald and, more important still, for every circumstance in which the practitioner and his patient may find themselves. It is the purpose of this article to discuss some of the principles involved in treatment, and to consider the advantages and difficulties which may be associated with different methods in common use.

At the outset it may be stated that no one method of treatment is suitable for every burn under every set of conditions. This apparently obvious assertion is necessitated by the extreme dogmatism which characterizes, and also mars, many of the most helpful views put forward on this subject. One great difficulty which always gives rise to confusion is associated with the respective functions of "first aid" and what may be termed "final treatment," and this arises from the fact that the injury of burning may represent anything from a trivial lesion which the body will deal with successfully whatever treatment is applied, to what may constitute one of the gravest injuries met with in surgery. The surgical treatment of ruptured peptic ulcer would not be so generally successful as it is to-day if the willing first-aid worker made the incision in the abdomen before the patient came to hospital, nor would the skin-tight plaster maintain its popularity if it were general for a patient with a Pott's fracture to return to work in a well-conceived but ill-executed plaster without any reference to a medical practitioner. These examples may sound absurd, but it is largely because of comparable misconceptions in dealing with burns that tannic acid has fallen into its present disfavour; and a method which is essentially a major procedure, only to be undertaken by someone properly trained and under conditions suitable for carrying out a major surgical procedure, has been largely discredited because in so many cases treatment was left at the first-aid stage.

AIMS OF TREATMENT

The aims of treatment are simple—(1) To prevent the death of the patient by controlling or making good the fluid loss and by preventing if possible the occurrence of that much criticized but very conveniently named condition of "shock"; (2) to anticipate and when possible prevent infection, (3) and to minimize so far as possible any resultant deformity. These admirable aims cannot always be achieved by the same method, and in certain circumstances the decision has to be made to forgo cosmetic results in order to keep the patient alive. Some of the critics who are most clamant as to the advantages of their methods and the dis-

advantages of other peoples', would do well to reflect that but for the simple-minded but sound insistence on ensuring the survival of the patient before considering other aims, they would have no opportunity of making such sweeping statements on the mutilating results following methods different from their own "Better a living problem than a dead certainty," a remark often quoted by Grey Turner and attributed to the late Jeans of Liverpool, should be regarded as an axiom.

SHOCK

It is essential first to consider in detail the difficulties and dangers which beset the burnt patient and the means available for overcoming or preventing them. In a severe case the most urgent need is the prevention or treatment of shock. The most important factors contributing to this composite clinical condition are the loss of circulating fluid, painful nervous stimuli arising from the damaged areas and, possibly, the absorption of products resulting from the burnt tissue.

The *loss of circulating fluid* may be counteracted by preventing further loss and allowing the body to bring the balance back to normal by the ordinary mechanism of eating and drinking. This method by itself, however, will not suffice in severe cases in which it is necessary to replace the fluid loss at once by serum transfusion. The prevention of further gross fluid loss may be partially achieved by the application of one of the tanning methods, although this procedure will not prevent the accumulation of fluid in the surrounding tissue. Limitation of fluid loss from the burnt surface and into the surrounding tissues may be achieved to some extent by the application of pressure in those parts of the body where this is applicable. For practical purposes this consideration usually limits the method to parts which can be readily bandaged. In certain circumstances no attempt to limit further loss may be made but the loss is made good by a serum transfusion which is continued until the burnt area recovers sufficiently to become impermeable. In most cases a combination of methods is used, further loss is limited and past loss is made up by the replacement of serum and by providing the patient with food and drink.

Painful nervous stimuli are dealt with by the administration of morphine and by local treatment to relieve pain.

The anticipation and *prevention of sepsis* is of fundamental importance and can only be achieved by an insistence on the necessity for treating a severe burn as a major surgical emergency. Prevention of deformity and restoration of function are aided by attention to the prevention of sepsis, always remembering that any burn which is more than second degree in severity can heal only by granulation unless steps are taken to replace the lost tissue by skin-grafting.

After this preamble it is proposed to consider some of the available procedures in detail.

TANNIC ACID TREATMENT

This method is placed first because of the honourable position it occupies in burn therapy and not because it is the method which has the widest application to day. Consider first the procedures which this form of treatment entails. First of all it is absolutely essential to remove from the damaged area every particle of dead epithelium—without introducing any infection. To carry this out properly it is essential to have full surgical amenities, it is not the type of treatment which lends

itself readily to the conditions likely to be found in a small ship in a rough sea. Great patience is required to carry out the cleaning process properly. The patient is given a full dose of morphine, and if several areas are involved those not under immediate review are covered with saline compresses until their turn comes. Debris and dead epithelium are now removed by combined use of non-toothed dissecting forceps and dry gauze, paying particular attention to the edges of the area, the damage usually extends farther than is at first thought. This process may take two or three hours but should be preferred to the harsh method of cleaning the area quickly under general anaesthesia. It is often found that after a time the patient complains of pain, and the analgesia may be reinforced by making an intramuscular injection of morphine ($1/8$ or $1/6$ of a grain for an adult). This injection usually produces the desired effect in under ten minutes. Refreshment for the patient during this tedious procedure must not be neglected, and if there is a good team of assistants and nurses it need not be withheld from the medical staff, who can work on the patient in relays.

This meticulous and systematic process of "cleaning" is the basis of other forms of treatment to be described and, if success is to be attained, it must be carried out with a care which cannot be over-emphasized. High surgical training is not a necessary qualification, and a conscientious nurse who has been shown what to do is able to carry out the process satisfactorily. Each area which has been "cleaned" is tanned with a solution of $2\frac{1}{2}$ per cent tannic acid, which is sprayed on lightly and evenly. Care is taken to allow the first coat of tan to dry before applying the next, and for this purpose an electric hair dryer is of value. It is when the process gets to this stage that several members of the team may be usefully employed, one to pick off burnt epithelium, another to use the spray, a third the hair dryer—and a fourth may ply the patient with sandwiches and cups of tea!

It is important to know what to aim at and what to expect in the way of a tan. Using the weak solution advocated, no visible tan can be expected in under half a dozen sprayings, but by using the hair dryer these half dozen sprayings can be accomplished in perhaps forty-five minutes. It will be noticed that exudation of serum and also pain cease before any tan is visible. Spraying should stop as soon as a thin brown tan is visible. Enthusiasts who produce a thick pie-crust have played an important part in making the method unpopular. After the tan has formed, the surrounding skin and the edge of the tan may be painted with a 1 per cent aqueous solution of gentian violet to prevent infection gaining entrance. It is wise to repeat this painting on subsequent days. The shrinkage of the tan which is said to occur is not very noticeable if the weak solution has been used, and in some cases the so-called shrinkage is really caused by the fact that the damaged epithelium extended farther than was originally thought. No attempt should be made to remove the tan as healing occurs, it will be found to peel off spontaneously without any trouble.

Tannic acid is useful in certain cases and in certain circumstances the circumstances are perhaps more important. Tannic acid should not be employed unless the patient can be received quickly and uncontaminated at a hospital or station sufficiently well constituted to deal with a major surgical problem. It should not be used on areas covered with hair, over joints, near the eyelids or lips, or in

periods up to three weeks. Frequently the burn is re-dressed at the end of ten days, because the patient complains of slight discomfort. At the re-dressing the surface should again be insufflated with sulphanilamide powder, fresh tulle gras applied and bandaged on as before. If tulle gras is unobtainable, vaseline gauze may be used instead, but it does not seem to have nearly such a stimulating effect on the growing epithelium. It must be emphasized once again that greasy dressings are permissible only if safeguards against sepsis are employed, and only if serum loss is controlled by firm bandaging.

GENERAL MEASURES

The "shock" associated with burns is attributable to fluid lost from the circulation, either into the tissues or from the burnt surface to the exterior, and to the effect produced by painful stimuli. The pain factor in the production of shock is satisfactorily dealt with by the injection of morphine ($\frac{1}{3}$ of a grain is suitable for a strong adult). If the effect of the injection wears off during the cleaning-up process an intravenous injection should be given. Food and drink should be given liberally if the patient is fit enough to take them. This simple restorative measure has been placed high on the list because it is so commonly neglected. But the restorative measure of inestimable value is the infusion of serum or plasma. Many patients are saved thereby, who would have died in the days before its introduction. Almost all really severe cases will be benefited by it, and many will die if it is withheld. Whenever possible, intravenous serum should be given immediately, delay may result in irreversible changes occurring which no amount of serum will counteract. It is important not to overtreat with serum, and if, to take the example of an otherwise healthy young adult, the systolic pressure has been raised to 110 mm. of Hg, and is still rising, it is wise to discontinue serum and rely on the mechanism of the body to complete the recovery. If intravenous therapy is not available much can be achieved by giving adequate food and drink by the mouth.

Serious criticism has been levelled at the use of heat in the treatment of shock. The practice of placing a semi-conscious patient under a hot cradle for hours on end, or of leaving an electric blanket in position for so long that the bare hair cannot be comfortably placed on the patient's abdomen, cannot be deprecated too strongly. Not only are valuable quantities of fluid lost by sweating but the protective vasoconstriction mechanism is undone. Overheating must therefore be guarded against and this can often only be ensured by the surgeon himself examining the patient frequently. The reactionaries to the "overheating school" have gone to the opposite extreme—leaving the patient with perhaps very little covering, shivering miserably and getting what comfort he can from a serum infusion. As to the criterion of what constitutes the correct temperature of the patient, few medical practitioners consider the comparatively simple method of asking the patient if he feels warm enough and of making the necessary adjustment.

FIRST-AID MEASURES

Anyone asked to advise suitable first-aid measures for a perforated peptic ulcer would rightly say that apart from getting the patient to a hospital quickly there are none. The same advice holds good for a really severe burn. What makes the advice so difficult in the case of burns is that all gradations of severity are met with from those of such gravity that only the most prompt and skilful attention can

prevent death, down to comparatively minor cases which will get well without any ill effects, provided that they are kept clean. It is the cases nearer the latter end of the scale which may be treated with tannafax, gentian violet, triple dye, or any other reputable form of treatment. They would get equally well with a dry dressing left in position until healing occurred—the only difference made by the treatment, and an important difference from the patient's point of view, is that some of the treatments mentioned would result in a speedy relief from pain.

Certain minor burns and scalds may be safely dealt with under first-aid conditions, but if treatment has been given by a nurse or first-aid worker the case should be referred to a medical practitioner who will not necessarily have to carry out any "final" treatment. Cases falling into this category should not be more than first or second degree in severity, the burns should not exceed approximately one-and-a-half inches in length, nor should those burns which occur on the face, hands, feet or genitalia be included. The treatment which may be used in these comparatively minor cases may be any of those mentioned. The important point to emphasize is that the worker under first-aid conditions must do nothing to contaminate what is essentially a clean wound. The small second degree burn on the forearm which occurs in civil practice from inadvertently touching a hot stove is an example of what may be called a "minor burn." This type may be treated under first-aid conditions by painting over and around the burn with gentian violet (1 per cent. in water) snipping the blister with sterile scissors and bandaging in position a pad of gauze on to which has been squeezed tannafax from a tube. The dressing is left until healing occurs. This particular treatment has been described in detail—not because it has great advantages over other methods but because it illustrates the sort of instructions which may be issued to first-aid workers who are called upon to treat burns and who may be far removed from more skilled aid, removed not perhaps by distance so much as by time.

For the severely burnt patient who can be taken quickly by ambulance to a hospital it is wise to give instructions that nothing should be done other than to wrap the affected parts in a sterile towel if possible or, failing this, a clean household towel or sheet, cover the patient with a blanket and send him off as quickly as possible.

What of the severely burnt patient who cannot possibly receive "final treatment" for some hours? This type of case is one of the great problems of war surgery. A good procedure under these circumstances is to snip the blisters with sterile scissors, dust the areas carefully with sulphanilamide powder, cover them with tulle gras or vaseline gauze and bandage firmly with crêpe bandage. An attempt is thus made to control sepsis by the use of sulphanilamide, and the further loss of serum is being limited by pressure. Morphine will usually be required, but above all full use must be made of the restorative powers of food and drink.

CONCLUSION

No one method of treatment is the best for all burns under every condition. The principles of treatment must be insisted upon rather than a slavish regard for any particular method. Any particular treatment which is chosen must be applied meticulously. A clear distinction must be drawn between "first-aid" and "final" treatment.

especially at hay-time Laryngitis had been frequent. As a child, she had seldom completed a term at school, owing to heavy colds and bronchitis

(2) Contracted fields, especially the right.

In October, a septal resection and right middle turbinectomy had lessened the pain about the right eye. In December, intra-nasal medication was begun. Two weeks later, she was able to use her eyes for needlework for hours without the pain, which for years had followed such use, and the senses of smell and taste were keener. After two months' treatment, the pain in head and eye had ceased and also the fits of sneezing, and she felt better than she had ever been in her life. After eighteen months, her condition was truly excellent, but as she occasionally had pain in the region of the gall-bladder, this was investigated and gall-stones demonstrated. In 1932, the gall-bladder, with 17 stones, and the appendix were removed. These were secondary infections, likely to give further trouble later on, if left, but obviously not the cause of her ill health, since she had fully recovered before their removal.

After about five years, at the age of fifty-seven, she bought and learned to drive a car, passed the test and has continued to drive since. Now, in 1943, she remains perfectly well and leads an active life for her age of sixty-five, as head of a play-centre.

For nearly fifty years, this patient had been in a condition of chronic ill health, often severe. When at last the sinusitis, which had given evidence of its presence throughout, was recognized and treated, even so late as at the age of fifty-two, health was completely and permanently restored. The pain in head and eye, which had persisted for thirty-six years, cleared in two months when the sinuses were successfully drained.

Case 6—A woman of sixty-two, first seen in 1926, presented a most curious stigmata appearance, inasmuch as her right upper eyelid drooped, whereas the left was retracted. The condition had been present for four months. About nine months previously, the patient had alarmed her friends by the loss of over two stone in four months, with considerable diminution in her previously excellent health, without anything to account for it so far as could be ascertained by any of the four medical men who had seen her, although two of them were well-known consultants, the one a physician and the other, seen three months later, a surgeon.

After such careful expert examination, a systemic cause for the eyelid condition could be eliminated, and search was made for a local cause. There were two clues—

(1) For six years the patient had entirely lost the sense of smell.

(2) For a year, there had been a creamy, yellow discharge from the right side of the nose, and every morning, a mass of muco-pus was cleared from the right side of the throat.

Clinical examination of the nose revealed only hyperæmia, more marked on the right side. X-rays only threw suspicion on the right antrum which, however, was exonerated when irrigation returned clear, with not even a flake of mucus. Then something happened which confirmed the diagnosis of sinusitis. Shortly after the antral irrigation, the patient noticed some return of the sense of smell, and the discharge lessened. It was then determined to irrigate all the sinuses, from all of which the washings returned perfectly clear, but the sense of smell became much keener, discharge ceased and the patient felt much better.

No change was noticed in the eyelid condition, although the son, a medical man, was confident there was an improvement in three weeks. She was given a spray of argyrol 10 per cent to be used twice daily, which she carried out intermittently for three months. Six months from the second irrigation the lids showed no abnormality whatever, there was no nasal discharge and the patient was in excellent health. The sense of smell was still slightly defective, but nine years later, when she reported, it had become completely normal.

The diagnosis in this case depended on symptoms and the effect of treatment, but there was one positive objective test. The washings from all the sinuses gave a culture of *Staphylococcus albus*. This was regarded as contamination, although the Watson Williams' method, which should exclude this possibility, had been followed. As in case 2, there can be little doubt that this organism was the lethal agent. The existence of an active focus of infection in the sinuses, thus demonstrated, throws light on the previous obscure illness. The patient had not mentioned

her nasal discharge, not connecting it with her ill health, and it had not occurred to any of the four medical advisers to inquire. Had they done so, much of the methodical work in the otherwise meticulous examinations would have been unnecessary, for the sinusitis was sufficient explanation of the general as well as of the later local symptoms. The consulting physician, with whom I afterwards discussed the case, had an opportunity later of seeing the patient again when called in consultation to one of her relatives. She then assured him she was in excellent health and he considered that her appearance fully justified her assertion. She was quite confident that her recovery was due to the nasal treatment, and he stated that the record would seem to teach that in the presence of vague and unexplained symptoms, the possibility of nasal sinus infection should be remembered.

This case illustrates once more how easily sinus infection may be missed, how serious such failure and how easily the disease may be conquered once recognized.

Case 7—A woman of forty-five, when first seen in 1929, complained of extreme nervous debility which had begun after a slight attack of influenza three years before. She suffered from severe headache, insomnia, "terrible" dreams, was giddy and had fallen several times, had lost weight considerably, had bouts of extreme fatigue, was depressed and, as her family practitioner had told her husband there was nothing the matter with her, had felt so hopeless that she feared suicide. Memory was very poor and she was quite unable to concentrate. Dysmenorrhœa had always been particularly severe with vomiting. She had just returned from a seven weeks' holiday, feeling worse. Indications of sinus infection were—

- (1) A cold the whole winter, with dry and crusted nose, pain over the right ear and mastoid, slight deafness and a ringing in that ear, occasional swelling of the right cheek and a choked feeling at the top of the nose which she could not clear. X-rays showed some dimness of the right antrum and ethmoid, and clinical examination showed signs of double ethmoiditis.
- (2) Contracted fields.

Three weeks in a private ward with frequent inhalations of friar's balsam largely restored the patient to a normal condition. In particular, sleep became excellent, and there was much post-nasal catarrh, formerly absent. After two more weeks in a nursing home, catarrh became free, the headache and giddiness were gone, she was rapidly putting on weight and sleeping the whole night through as she had not done for two years. In two-and-a-half months, with further intra-nasal medication, she was feeling better than she had ever done in her life. She remained under observation four years, well and active in her home and church life and, incidentally, entirely free from dysmenorrhœa.

In this case the sinusitis was obvious, but it had not been connected by either the patient or the family practitioner with her serious nervous condition.

CONCLUSION

The promptness and permanence with which all these seven patients were lifted right out of the category of "chronics," after prolonged periods within it, indicate a search for a clue in the para-nasal sinuses in every otherwise unexplained case of ill health. Such a clue can often be elicited on inquiry, in definite symptoms, though these may not be volunteered. Even if such are not forthcoming, the contracted fields of vision, the history of onset with some rhinological affection, and the past history of other results of a septic focus will be sufficient to clinch the diagnosis. Confirmation follows when as the result of drainage the fields steadily widen, as in these cases, and the health is restored. Dysmenorrhœa or excessive menstrual loss, or both, was present in three of the cases. The prompt and permanent relief of these conditions as a result of the nasal drainage, suggests that they were secondary results of the sinus sepsis.

THE INTERPRETATION OF PHYSICAL SIGNS

III—IN DISEASES OF THE NERVOUS SYSTEM

By C M HINDS-HOWELL, M D, F R C P

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THE importance of taking an accurate clinical history is strongly impressed upon all medical students. In the investigation of a patient suffering from some disorder of the nervous system such a history may be of fundamental importance, for on it may depend the possibility of making a correct diagnosis. Not only must the present evolution of symptoms be obtained, but the past must also be explored for any incident which may clarify the significance of some presenting symptom. For instance, a patient may complain of difficulty in walking and is found to have an extensor type of plantar reflex. Unless specifically inquired for, the occurrence of some transitory loss of visual acuity—which may have happened a number of years before—is quite likely to be omitted by the patient. Yet such a symptom would probably clinch the diagnosis of disseminated sclerosis. Inquiry must of course include the family history, as this may throw light on familial diseases—epilepsy and so on.

Whilst the history is being taken, light will be thrown on the patient's speech (dysarthria, aphasia, stammer), his education, mental capacity and emotional reactions. From this, fruitful observations may be made which may assist in arriving at such diagnoses as frontal tumours, disseminated sclerosis, general paralysis of the insane, bulbar palsy, paralysis agitans, and it will also serve to facilitate a reply to the first question which the examiner must put to himself, i.e., "is the patient suffering from an organic or a psychoneurotic condition"? For the purposes of the present article, it must be assumed that the answer is organic.

The examination must then proceed in a methodical manner. This must include not only the whole of the nervous system but the whole of the patient. Frequently the signs of disease in the nervous system which may cause the presenting symptoms are found to be merely a manifestation of a primary disease elsewhere. For instance, in the blood (pernicious anæmia and subacute combined degeneration in the spinal cord), vascular disease with hypertension (hemiplegia, papilloedema, retinal hæmorrhages), cardiac disease (endocarditis, hemiplegia, cerebral aneurysm), pulmonary disease (bronchiectasis and cerebral abscess, or bronchial carcinoma and secondary deposit in the lungs), prostatic carcinoma (with secondary deposit in the brain), and so on.

THE CRANIAL NERVES

So far as the examination of the nervous system goes, a methodical routine should always be followed: the cranial nerves, motor and sensory system, reflexes, gait, with lumbar puncture, Wassermann in blood and cerebrospinal fluid, and possibly a blood count as additional laboratory investigations.

It is quite impossible within the limits of this article to deal in a comprehensive

manner with the significance of all the physical signs which may be elicited in connexion with diseases of the nervous system. It is proposed first to take certain aspects of disorders of the cranial nerves.

(A) *VISION*—Visual fields and visual acuity should always be tested. The fields can be tested roughly by the confrontation test. Hemianopia, either homonymous or bitemporal, can be easily recognized by this method, and the presence of scotomas ascertained, although their actual extent is not accurately determined. *Right or left-sided hemianopia* is due to a lesion, either of the optic tracts, when it is likely to be complete, or of the cerebral path of the visual fields on their way to or in the occipital cortex, when the hemianopia may possibly be incomplete. This is particularly likely to be the case with a lesion such as a tumour or abscess in the temporo-sphenoidal lobe, which interrupts some only of the visual fibres—at any rate at first—thus causing a quadrantic hemianopia.

Bitemporal hemianopia is due to a chiasmal lesion, which may be caused by a number of pathological conditions. Of these, pituitary tumours are the most common, but aneurysm, meningioma, syphilis, arachnoiditis, or thrombosis may also cause it.

Scotomas are usually due to retrobulbar neuritis, and of this the most common cause, in young adults at all events, is disseminated sclerosis. This is often the first symptom of the disease, and as a rule the examination of the rest of the nervous system is negative. Sometimes there is only a short interval before further signs appear, but the latent period may on occasion be a long one—

A female patient, aged forty, consulted me for a slowly progressive spastic paraplegia. When asked if she had had any nervous troubles in the past, she denied any, but when pressed she remembered that nearly twenty years before she had "lost the sight of one eye" for some weeks, for which she gave the remarkable explanation that a tarantula spider had run over her face! The retrobulbar neuritis of those far-off days was the forerunner of her disseminated sclerosis.

Ophthalmoscopic examination of the fundus must be part of the routine examination. *Optic atrophy or papilloedema* are the most common neurological findings. It is not possible to discuss all the causes of atrophy, but papilloedema is a sign of increased intracranial pressure, though the causes of that condition are many. It is important to remember that it occurs in malignant hypertension, and in this case hæmorrhages in the retina are likely to be prominent and the urine will contain albumin.

Hydrocephalus, however produced, may lead to papilloedema. This is most important when it occurs as a complication of otitis media, acute or chronic, for the suspicion of intracranial abscess will surely arise. This conclusion may be strengthened by single or bilateral sixth nerve palsy. Lumbar puncture, if it produces a normal fluid under high pressure—300 mm. or more—will make the diagnosis of hydrocephalus clear and the outlook so much the more hopeful.

It is important to remember that a high degree of papilloedema may exist for a time without any impairment of vision. As an illustration of the importance of ophthalmoscopic examination, let me quote the following—

A girl of twenty-three was admitted to hospital with a pleural effusion and raised temperature. The effusion was aspirated and was thought to be tuberculous. About two weeks later, the girl had a series of epileptic fits over a period of three days. Inquiry showed

that eighteen months previously she had had an epileptic attack. She had the scars of a number of small ulcers just above her ankles on both legs. It was found on further inquiry that she had suffered from headache for eighteen months, and on several recent occasions had vomited without warning. She was found to have bilateral papilloedema, but no other abnormal signs. The pleural effusion, the scars on her legs, and the fits suggest that she may have a tuberculoma in the brain and that her fits are "symptomatic" and not idiopathic.

(B) *PUPIL REACTIONS*—Many types of abnormal pupil reactions are found, the Argyll-Robertson being the best known. Typically in this form the pupil should be small, often unequal in size and irregular in outline, and the iris frequently a pale blue colour from atrophy. The pupil is inactive to light, but should react briskly on convergence. The significance in 90 per cent. of the cases is neurosyphilis, a condition which may of course exist without the Argyll-Robertson pupil. It is important to differentiate the myotonic from the Argyll-Robertson pupil. In the former, the pupil is frequently moderately dilated and, though inactive to light, contracts *very slowly* on convergence and dilates as slowly again afterwards. This pupil is often found associated with absent knee jerks. Because of this, I have known the diagnosis of tabes dorsalis to be made, although other signs of tabes were wanting.

One case which comes to mind is that of a fine young athlete who was turned down by the medical officer of an important industrial concern, who refused to be convinced by my arguments showing that the boy had not got tabes. However, I am glad to say that a more enlightened medical officer in a rival concern gladly accepted him.

(C) *OCULAR PALSIES*—Here differentiation must be made between those due to a peripheral nerve lesion of the third, fourth, or sixth cranial nerves on the one hand, and nuclear or supranuclear lesions on the other.

In the former, individual muscles will be affected, whilst in the latter conjugate movements of both eyes involved will be present. Perhaps the most common example of such conjugate paralysis is to be seen in recent cases of hemiplegia, when the eyes may be found deviated, during the acute stage, towards the side of the lesion, i.e., away from the paralysed side.

Another example of conjugate paralysis may sometimes be seen as a sequel to encephalitis lethargica, when upward movements may be lost, whilst, following the same disease, spasm of conjugate movement upwards is met with in the distressing condition known as oculo-ogyric crises. In these the eyes roll up involuntarily, and it may not be possible to get them down again until the patient has gone to sleep.

THE FIFTH CRANIAL NERVE—This nerve supplies by its three peripheral sensory branches the skin of the face and forehead and the mucous membranes of the eyes, nose and mouth. By its motor root the muscles of mastication are innervated. Loss of function in any or all of these branches may be caused by tumour, syphilis, aneurysm, inflammation and vascular lesions. An example of one type of inflammatory lesion is a virus infection of the Gasserian ganglion, often with maximal incidence on that part of the ganglion which receives the first or ophthalmic division giving rise to the clinical picture of herpes ophthalmicus. Occurring perhaps more commonly in elderly subjects, it is often followed by a most intense and intractable neuralgia, which may persist for years. Unless great care is taken of the cornea, the formation of opacities may interfere with vision in the affected eye and add to the miseries of the patient.

Of great importance, though devoid of physical signs, are the different forms of neuralgia of the fifth nerve. Apart from post-herpetic neuralgia, these may be divided into two main groups—(a) reflex neuralgia, and (b) tic douloureux. Reflex neuralgias are fortunately the commoner of the two. Everyone is only too familiar with neuralgia set up by dental causes. This has, however, the disadvantage that it leads in many cases to the useless sacrifice of perfectly sound teeth for the attempted relief of trigeminal tic. It is important to recognize the neuralgia set up by an infected sinus or antrum, and to differentiate this from tic. These sinus neuralgias—which may be exceedingly severe—lead to a more constant type of pain than the intermittent lancinating stabs of tic. Another remarkable feature of sinus neuralgia is its periodicity, which again serves to differentiate it from tic. In many cases the pain recurs at the same time of day—a fact forcibly impressed on my mind by having myself had a neuralgia due to an antrum, which recurred each day at 10.30 a.m. and had practically passed off by teatime. A last point is that an *isolated* neuralgia of the first division, such as occurs with frontal sinusitis, is exceptional in tic.

THE SEVENTH CRANIAL NERVE—This nerve may be affected by the same pathological processes as have been mentioned for the fifth nerve, but in addition exposure to cold may produce a Bell's palsy, owing to the superficial position of the nerve as it emerges from the stylomastoid foramen. It is important to remember, however, that in many cases of Bell's palsy the condition is probably due to an infection, possibly the result of virus activity. Such an infection is quite certainly the cause of what is known as geniculate herpes. This is not a common condition, but it is important to recognize it. Pain in the ear is followed by a severe facial paralysis with the appearance of herpetic vesicles on the tympanum and in the external auditory meatus. The fauces are injected on the affected side, and vesicles—soon turning to small ulcers—may appear on the soft palate and anterior pillars of the fauces. There is often a febrile reaction. Unless care is taken, the condition may be mistaken for an acute otitis media, to which the appearance of an aural discharge from the ruptured herpetic vesicles in the meatus may add a spurious resemblance.

Brief mention must be made of another type of paroxysmal neuralgia which occurs—though fortunately but rarely—in connexion with the *ninth cranial nerve*. It is known as glossopharyngeal tic and is characterized by stabbing pain in the throat, which seems to pass up to the ear on the affected side, the latter symptom being due to the tympanic branch of the nerve. When established it is as intractable as trigeminal tic. The only effective treatment then is by surgery.

One of the most dramatic clinical pictures that can be met with in which several cranial nerves are involved is caused by *thrombosis of the posterior inferior cerebellar artery*. This vessel—a branch of the vertebral or basilar arteries—seems to be unduly liable to thrombosis. The clinical picture which results is most baffling unless the anatomy of the lateral part of the medulla is remembered. It is then perfectly simple. I may remind readers that in this area the following structures are situated: the inferior cerebellar peduncle, the spinal root of the fifth cranial nerve, the motor nucleus of the ninth and tenth cranial nerves, a ciliospinal centre or nerve fibres which ultimately reach the sympathetic ocular fibres via the cervical sympathetic, and the spinothalamic fibres, carrying sensory impulses of pain and

thermal sensation from the opposite side of the spinal cord. The patient who has a thrombosis of this artery is seized with intense vertigo, often accompanied by pain in the face and vomiting. Consciousness is not often lost. As the acute phase passes off, the patient is found to have cerebellar ataxia on the side of the affected artery, loss of sensation on the same side of the face, ocular sympathetic palsy with small pupil and narrowed palpebral aperture, palatal paralysis and paralysis of vocal cord, all on the same side, whilst on the opposite side of the body, neck, trunk, arm and leg, there is loss of sensation to thermal and painful impulses. Although the onset is usually extremely severe, the majority of patients not only survive but make a good recovery.

An old friend, a keen sportsman, had a thrombosis of this artery when well over seventy years of age. This was in the winter, but he was able to be out shooting in the following season.

THE MOTOR SYSTEM

Anatomically, there are concerned in this system the upper (pyramidal tract) and lower (peripheral motor nerve) motor neurons, the extra-pyramidal motor system and the cerebellum. Lesions of these motor paths will result in paresis or paralysis, with alteration of muscle tone, muscular coordination, reflex activity and, in some cases, with muscular atrophy.

The effects of lesions of the upper and lower motor neurons can be compared in tabular form —

<i>Upper motor neuron</i>	<i>Lower motor neuron</i>
Paresis or paralysis either mono-, hemi-, di-, or paraplegic	Paresis or paralysis of peripheral nerve or groups of peripheral nerves
Muscle tone increased	Muscle tone diminished
No muscular wasting apart from disuse	Muscular wasting marked
Tendon reflexes increased, with possibly ankle clonus and extensor plantar reflexes	Tendon reflexes diminished or lost
Abdominal reflexes often absent	Abdominal reflexes absent (if affected)
Electrical reactions unaffected	Electrical reactions R D (reaction of degeneration)
Sphincters often affected	Sphincters usually unaffected

Lesions of the extra-pyramidal motor system result in alteration of muscle tone and involuntary movements. Familiar examples are paralysis agitans and the "Parkinsonian" condition following encephalitis lethargica. Muscle tone in these disorders is increased, but in a rather different manner from that which obtains following lesions of the pyramidal tracts. In the latter there is a selective increase in tone, this being preponderantly increased in the flexors of the upper and in the extensors of the lower limb. This gives rise to what has descriptively been termed "clasp-knife" rigidity. Following lesions of the extra-pyramidal motor system, the increase in muscle tone is global rather than selective (lead-pipe rigidity). Tendon reflexes are as a rule increased, but the plantar reflexes retain their normal type (flexor). The muscular rigidity in paralysis agitans results in the expressionless face (Parkinsonian mask), which is one of the most typical and diagnostic features of the disease. It also results in paucity of movement, hence disinclination to swallow and consequent dribbling, and loss of finer movements in the finger. Muscular power remains good, but is ultimately prejudiced by increasing spasticity.

The onset of this disease is frequently hemiplegic and may often be accompanied by a little tremor—a fact which may lead to errors in diagnosis. It would be too much to say that the most common cause of hemiplegia of gradual onset in late middle life is paralysis agitans. Involuntary movements which result from lesions of the corpus striatum (basal ganglia) in this instance take the form of tremor, as seen in the extension of wrist, pronation-supination of forearm, or pill-rolling movements.

Lesions of the cerebellum may lead to some or all of the following symptoms: ataxia, loss of muscle tone, speech defect, nystagmus, muscular weakness, reflexes not usually affected in any characteristic manner.

The cerebellum may be affected by tumour, inflammatory and vascular lesions, disseminated sclerosis and degenerative conditions and certain rare familial disorders. The ataxia is the result of incoordination of muscular movement and is illustrated by nystagmus, intention tremor and a gait which resembles that of a drunken man. The speech defect is also the result of muscular incoordination and resembles that sometimes found in cases of disseminated sclerosis. A further way in which muscular incoordination can be brought out is by asking the patient to perform rapid alternation of movement—for instance, rapid pronation and supination of forearm. With a cerebellar lesion they will fail to do this efficiently on the affected side (dysidiadochokinesia). Each cerebellar hemisphere has a homolateral connexion with the spinal cord, unlike the crossed connexion of the cerebral cortex.

THE LOWER MOTOR NEURONE—The incidence of disease may be anywhere from the anterior nerve cell to the motor end plate in muscle and, as elsewhere in the nervous system, may be acute, subacute or chronic.

Acute anterior poliomyelitis affords the best example of acute disease. Although its incidence is highest in the young, it must not be forgotten that adults may be affected, also that *formes frustes* of the disease may occur. Except in epidemics, the latter type is likely to go undiagnosed, but a mild febrile reaction with headache and some rigidity of the neck are suggestive. Lumbar puncture with increase in cells up to 70 or 100—probably polymorphonuclear at this stage—would support the diagnosis. The protein content of the cerebrospinal fluid, not much increased at first, gradually rises as the number of cells falls. At this stage the patient may complain of muscular pains, perhaps severe, on account of which a diagnosis of acute rheumatism may be made. It is important to note that the pains are in the muscles and not in the joints. The appearance of a flaccid palsy in various segmentally supplied muscle groups makes the diagnosis certain.

Subacute examples of lower motor neurone disease are furnished by the various forms of *multiple peripheral neuritis*, although some indeed of these may be fulminating, as for instance *Landry's paralysis*. If this is not fatal within a few days, recovery in full may be expected. In this disease there is no affection of the sensory (afferent) paths, but in what is known as *acute toxic polyneuritis* there is as a rule some evidence of sensory impairment, varying from mild to severe loss of sensation, and often preceded by paresthesia in the form of tingling and numbness. The etiology of these conditions, though not firmly established, is generally regarded as due to virus infection. Unless the patient dies, the ultimate prognosis is good.

complete recovery is good, a remark which also applies to the multiple neuritis of diphtheria. The cerebrospinal fluid in cases of acute toxic polyneuritis will often be found to contain a surprisingly high protein content (300 to 500 mgm per cent).

Examples of a chronic type of lower motor neurone disease are seen in *progressive muscular atrophy*, *bulbar palsy* and *amyotrophic lateral sclerosis*, in the latter type however, the upper motor neurone is involved as well.

Before leaving the motor system, brief mention must be made of the significance of involuntary movements. Chorea (Sydenham's and Huntingdon's), tremors, torsion spasm, tics, spasms and myoclonus come into this category.

Of *Sydenham's chorea* little need be said, but it is important to emphasize that paresis rather than involuntary movement may predominate, and this may have a hemiplegic distribution—circumstances which may at first cause a little difficulty. *Huntingdon's chorea* occurs in much older people, often with a family history, with speech defect and mental impairment.

Tremor occurs in a variety of pathological conditions. Intention tremor in cerebellar disease is not really a true tremor but is due to muscular incoordination. Lesions of the basal ganglion, particularly the corpus striatum, are likely to be followed by tremor, associated with an increase in muscular tone. The tremor of paralysis agitans may be taken as a type. There is possibly a striatal factor in senile tremor too, but widespread degenerative changes in the brain make exact localization difficult. Tremor as a manifestation of fear is well known, and is met with in anxiety states without focal anatomical basis.

Other examples of involuntary movements of striatal origin occur, but are rarely met with.

Tics must be differentiated from chorea. Occurring first as a rule in childhood, they are often continued into later life. They differ from chorea in that they consist of purposive, coordinated movements, which can be voluntarily inhibited for a time, at any rate. They are movements which may be appropriate under certain circumstances, but which by repetition become inappropriate. They belong to the category of obsessional neurosis.

As opposed to the tics, are *spasms*. These are movements which result from irritation of the peripheral reflex arc, exemplified by the facial spasm often seen in *tic douloureux*. But facial spasm involving part or all of the supply of the seventh cranial nerve occurs apart from any painful accompaniment, sometimes due to irritation of the nerve in the petrous bone, but more often with no definitely ascertainable etiology. *Myoclonus* (short sharp muscular contractions—usually of individual muscle bundles) is most commonly seen in degenerative conditions of the lower motor neurone, e.g. progressive muscular atrophy, and is then known as fibrillation of muscle. Not all such cases have a pathological basis, an important fact to realize. Medical students who occasionally notice these fibrillary tremors in their own muscles, are inclined to take needlessly gloomy views of their prognostic significance. Rarely, widespread myoclonic contractions occur as a disease *sui generis*, and these sometimes are accompanied by epilepsy. Apart from these uncommon diseases, it is not unusual for epileptics to experience short uncontrollable muscular jerks apart from their fits, indeed these may precede the onset of the fully developed fit.

THE SENSORY SYSTEM

Sensory manifestations of disease are of two kinds—(a) subjective and (b) objective

(A) *SUBJECTIVE SENSORY SYMPTOMS*—These include a number of abnormal sensations, such as numbness, tingling, "pins and needles," pressure, thermal sensations and pains for which there is no obviously appropriate stimulus (any of these are grouped under the term *paræsthesiæ* and sometimes *dysæsthesiæ*) they occur in a variety of disorders of the nervous system. Thus they are prominent early symptoms in many types of *peripheral neuritis* and in *subacute combined degeneration of the spinal cord*. In both cases the distribution of *paræsthesiæ* is usually symmetrical, peripheral and apt to include all four extremities. In *disseminated sclerosis* their distribution is more haphazard and their manifestations show a greater variety of abnormal sensation. Here their origin is central, i.e., in the spinal cord or brain, and not peripheral as in the former instances.

Arteriosclerosis of cerebral vessels not infrequently causes *paræsthesiæ*, often hemiplegic in distribution. Seemingly spontaneous pain is an important symptom. It may have peripheral or central origin, though the former is the commoner type. It is always wise to pay careful attention to the complaint of pain by a patient, even though such complaint may seem exaggerated. Pain from pressure on spinal posterior roots may be misleading. I have seen the appendix removed in one case, and a kidney explored in another, for what eventually proved to be an extramedullary spinal cord tumour.

I was much impressed by a case which came under my observation in the 1914-18 war. The patient, a healthy-looking youth, complained of pain in the right chest, about the nipple line. He was seen by the regimental medical officer and given medicine and duty. He complained thereafter so frequently and without apparent cause that he was threatened with various penalties. He persisted, however, and was sent home. Admitted to a hospital, a positive Wassermann reaction was returned in his blood. Although denying any risk of infection, he was put through a course of arsenical injections. I lost sight of him then until, about a year later, I came across him in a military hospital with a spastic paraplegia and sensory level up to the nipple. Laminectomy was performed, and a tumour about the size of a monkey-nut successfully removed. The patient made a complete recovery.

The pains which so often precede the more obvious signs of *tabes dorsalis* are well known, but not so often recognized as they should be. When accompanied by abdominal symptoms, they may simulate some surgical condition. Nowadays, surgeons are better educated in neurological possibilities than they used to be, but a good many years ago there were three patients in the National Hospital, one minus an appendix, another without a gall-bladder, and the third with a gastro-enterostomy, what they all had in common was *tabes dorsalis*.

The pains and discomforts which may occur in a hemiplegic distribution following a lesion in the region of the optic thalamus often prove most refractory. The pain which often precedes the development of the eruption in *herpes zoster* must be mentioned, as for a day or two it may cause difficulty.

(B) *OBJECTIVE SENSORY PHENOMENA*—During the examination of the nervous system, the different aspects of sensory function must be tested. Note must be made of the distribution of any loss of sensory perception which may be discovered, and of the particular aspects of sensation affected. It should not be difficult to decide whether these correspond to peripheral nerve, spinal root or

segment, spinal cord or cerebral distribution. Indeed the loss may not correspond to any known anatomical distribution at all, and it is then clear that the case must be an ideational, or in other words hysterical, sensory loss. The examiner, in testing the patient, must be careful to avoid any suggestion, as hysterical anaesthesia is easily manufactured, and also to make the examination under favourable conditions for the patient. Nor must the examination be too protracted, and the results must be confirmed by more than one sitting. It will usually be found that sensory findings are complementary to observations on motor and reflex functions, and thus help in accurate diagnosis. To take as an example a patient presenting atrophy of the intrinsic hand muscles, (a) without any sensory loss, (b) with loss of pain and thermal sensation in the arm, but not of tactile sensation, (c) with sensory loss to all forms of stimuli confined to the hand, (d) with loss of sensation along the ulnar side of forearm. Here the sensory findings will assist the following probable diagnoses—(a) progressive muscular atrophy or lead palsy, (b) syringomyelia, (c) lesion of median and ulnar nerves, (d) lesion of first thoracic posterior and anterior roots or lowest cord of brachial plexus—e.g., by cervical rib.

The distribution of posterior root areas is easily learnt and is of the utmost value. A final word with regard to testing sensation—Do not forget that the patient has a posterior aspect, as all the sacral root areas lie on the *back* of the leg, thigh and buttocks, and so may be overlooked.

REFLEXES

Space will not permit any detailed description of the significance of reflex activities. Loss of reflexes usually means an interruption of the spinal reflex arc—except immediately following cerebral or spinal shock, when they will in any case be absent—but a word must be said about bladder reflexes. These play an important rôle in nervous diseases, and on the efficient management of the bladder the patient's life may depend. Every gradation of disturbance of bladder function is met with, from precipitant micturition to incontinence on the one hand, dysuria to retention on the other. In disseminated sclerosis precipitant micturition is more common than dysuria, whilst in tabes dorsalis the converse is the rule. Pressure on the spinal cord at first causes dysuria and later goes on to retention, and the latter obtains following spinal or cerebral shock, as in cerebral vascular accidents. Many patients with slight bladder symptoms are seen first by surgeons and, if nothing is discovered in the course of urological examination to account for their difficulties, they are handed over to the physician. Sometimes an apparent cause turns out not to be the effective cause of trouble.

I remember some years ago being asked to see a patient by a surgical colleague. The man's business took him several times a year to South America. He complained that in hot weather he had difficulty in passing his water and in cold weather in holding it. The surgeon had removed the man's prostate, but when his abdominal wound should have healed it broke down. I found that the patient had extensor plantar reflexes and positive Wassermann reaction in blood and spinal fluid. His symptoms were due to neurosyphilis.

May I, in conclusion, recommend the study of the physiology and anatomy of the nervous system—so apt to get rusty with the lapse of time—to all those interested in this aspect of medicine?

NOTES AND QUERIES

THE EFFECT OF CHEWING-GUM ON THE TEETH

QUESTION—I should like to get some authoritative opinion about chewing-gum. I suppose it is one of the effects of having so many Americans over here, but a lot of my children's patients now have adopted this form of sweet-teat. Is it good or bad for the teeth? Or perhaps the question might be put the other way round—are the good teeth seen frequently amongst our American visitors in any way due to the use of chewing-gum?

REPLY—The effect of chewing-gum is cleansing, but this beneficial result is almost entirely limited to the teeth used and would have little effect on the front teeth. The salivation induced would help to clean all the teeth. The sugar would be quickly washed away and would do no harm. Excessive chewing on particular teeth might wear away the cusps and upset the bite. Americans are not usually credited with good teeth. Possibly many of those with good teeth at present in this country, come from rural districts where diet is more "natural" than in the towns.

SIR NORMAN BENNETT, M.B.,
M.R.C.S., I.D.S.

PSORIASIS

QUESTION—Can some expert enlighten me further on the treatment of psoriasis. I have failed to cure a severe case in which the arms and legs are affected. Perhaps I am using the wrong dosage or the wrong hormonal extract. I used syncortyl 5 mgm daily; vitamin B complex, 4 capsules daily; vitamin C, anterior pituitary growth hormone $\frac{1}{2}$ c.cm twice weekly; and eliminated fat from the diet. What specific preparations should I use and what dosage?

REPLY (from a dermatologist)—Dermatologists are in agreement that the cause of psoriasis is unknown, and therefore it may be argued that hormonal dysfunction and vitamin deficiency cannot be excluded as possible etiological factors. The investigations of Dodds, MacCormac and Robertson have shown that neither a high nor a low fat diet has any effect whatsoever on the eruption. Treatment, it is usually considered, relies on external applications, such as salicylic acid ointment in the more acute phases, and one of the recognized textbook ointments for an established eruption. The importance of a thorough application is perhaps not always recognized by patients, who are unwilling to

spend one hour or more daily on their treatment. Some patients respond well to ultra-violet radiation, a clean and simple procedure.

INTRACTABLE SEXUAL FRIGIDITY

QUESTION (from a subscriber in Lancashire)—I have been asked to treat a woman, age thirty-three, who has been married for ten years and, although she has a child seven years old, has always suffered from sexual frigidity. Five grain doses of stilboestrol have been taken for some days after each menstrual period and she has also used suppositories containing 10,000 I.U. of oestrone daily and an ointment (neo-hombreol) applied locally for clitoral stimulation—all without any effect. The patient's sister is similarly affected. Could you offer any further suggestions as to treatment?

REPLY—Frigidity does occasionally respond to hormone therapy and the treatment with stilboestrol and the neo-hombreol ointment is much to be commended. Failure to respond to this, I think, points to a psychological cause, which is frequent in many of these patients.

DOUGLAS MACLEOD, M.S., F.R.C.P.,
F.R.C.S., F.R.C.O.G.

RINGWORM OF ANIMAL ORIGIN

A READER in Wales writes—Some years ago a question from me on calf ringworm was printed, and Dr J. Ingram gave a valuable remedy:—

R Brilliant green	$\frac{1}{2}$ per cent.
Mercuric chloride	$\frac{1}{2}$ per cent.
Industrial spirit	99 per cent.
Ft. paint.	

Ringworm caught from cattle is a daily event in this part of Wales. Horses get it, but I have not seen it in sheep, dogs or cats. The lesion is nearly always in front of the wrist, and is often raised with pus present. It must be treated like scabies, i.e., every scrap of clothing and bedding must be disinfected. Sometimes non-farmers become infected. A few days ago I saw a man who had carried an infected trough on his lorry; he had ringworm on the wrist. All farm buildings, posts, rails and gates, where cattle rub, are infected and should be lime washed and the cattle treated. It is no easy matter to clean infected buildings, they must first be sprayed over. Patients often treat themselves with tincture of iodine, or ink, the only thing to do then is to apply zinc ointment.

PRACTICAL NOTES

HEAT IN THE TREATMENT OF SHOCK

THE use of heat in the treatment of traumatic shock, for the relief of cutaneous vasoconstriction, is a generally accepted procedure at the present time. That it may, however, have an adverse effect is indicated by the results obtained by A. W. Kay (*British Medical Journal*, January 8, 1944, I, 40) in an investigation carried out in a series of fifteen young adult male patients convalescing from minor surgical operations or awaiting the same. Heat was applied by means of the hot-air cradle, the temperature used varying between 38° and 40° C. Observations concerning the arterial blood pressure, the venous blood pressure, pulse rate, oral temperature and the patient's general condition were made before applying the heat, at ten minute intervals during the application and for forty minutes afterwards. In order to bring the investigation into line with the treatment of shock, normal saline was given by the intravenous route in ten cases, the dosage varying between 200 and 1,000 c.cm. Intravenous plasma, in amounts ranging from 250 to 700 c.cm. was administered in the five other cases. In addition to a constant fall in arterial blood pressure, rise in venous blood pressure, increased pulse rate and rise in oral temperature, marked effects on the patients' general condition were noted, these symptoms being so severe in three cases that the experiment had to be abandoned. In every case flushing was present before the termination of heat application, and frontal headache was common, the headache often persisting for twelve to twenty-four hours after the application. Dehydration was present in nine cases, nausea in six, followed in two instances by vomiting. Sweating was noted in all cases, and abdominal discomfort, muscular pains and exhaustion were also present. In view of these findings, particularly as regards the flushing, the fall in arterial blood pressure and the dehydration, the author suggests that prolonged application of heat in cases of traumatic shock may prove harmful rather than beneficial.

TREATMENT OF ESSENTIAL DYSMENORRHOEA WITH ETHINYL OESTRADIOL

THE results obtained in a series of twelve patients with essential dysmenorrhœa treated by oral administration of ethinyl oestradiol, a synthetic oestrogen of high potency, are recorded by R. A. Lyon (*Surgery, Gynecology and Obstetrics*, December, 1943, 77, 657). The ages of the patients ranged from nineteen to thirty-five, and in no case was an additional

gynaecological disorder present. Ethinyl oestradiol was given orally in dosage of 0.05 m.m. once daily, beginning at least twenty-one days before the menstrual period and continuing for twenty-four days. The general plan of treatment was oestrogen for two successive cycles, and the one menstrual period without treatment. Some alteration in the length of the cycles was noted during oestrogen treatment, i.e. the duration of bleeding was 1.8 days longer and the flow was less profuse. In consequence the succeeding cycles, particularly when untreated, were usually shortened to 25 or 26 days. Forty-four cycles were treated, in six there was no bleeding and either an additional 24 tablets of ethinyl oestradiol were administered after a free interval of one week or a normal menstrual period without treatment was allowed. In the latter event dysmenorrhœic cramps invariably occurred. Toxic reactions in the treated series were nil, and the treatment was well tolerated and liked by the patients. As the basic principle of the treatment is the temporary suppression of ovulation the importance of instituting treatment at least three weeks before the menstrual period should not be overlooked. None of the patients treated failed to ovulate when the treatment was withheld. Prolonged ovarian rest or suppression of the follicle-stimulating hormone has been shown generally to be undesirable; the method therefore is advocated not as a cure but as providing a temporary relief in intractable cases of dysmenorrhœa, and also, as these patients usually show immature development of personality, the method was found to inspire the necessary confidence which is frequently lacking. The patients in the reported series were under observation for from six to fifteen months. In view of the potency of ethinyl oestradiol results can be obtained with low dosage. The method of two treated cycles and one untreated is advocated in order to preclude persistent oestrinism.

SWIMMING-BATH CONJUNCTIVITIS

SWIMMING-BATH conjunctivitis, or inclusion blenorrhœa or conjunctivitis, is a virus disease due to contamination of the water. Inclusion blenorrhœa also occurs in the newborn through infection at birth from the genital canal of the mother. Inclusion bodies have been found in the urethral epithelium of males with urethritis, and the proposition is put forward by E. H. Derrick (*Medical Journal of Australia*, October 23, 1943, 30, 334) that contamination of swimming-bath water may be due in some instances to this cause. The symptoms are the

in onset, usually appearing after an incubation period of three to four, or in some instances seven, days, starting with a mild hyperæmia followed by slight swelling of the lids, a painless swelling of the pre-auricular gland, photophobia and considerable irritation. The conjunctiva becomes swollen and on the seventh to tenth day follicles appear. The onset is usually unilateral, the second eye becoming infected in two to three weeks time. Inflammatory symptoms appear in from three to four weeks but for two months the mucous membrane remains thickened and hyperæmic, and four to six months later the condition resembles folliculosis, the follicles disappear slowly. The conjunctivitis has been reported to respond well to treatment with sulphonomides, and in infants the use of a 5 per cent sulphathiazole or sulphathiazole sodium ointment, applied six times daily, has been found effective. Three cases in boys, in whom the condition showed itself six and seven days after spending several hours together in a swimming-bath, are recorded by the author. In two only one eye was affected, in the third case the second eye became infected two days later. There was considerable rise in temperature on the second day of the illness—in two cases to 102° and 102.4° for four days—and then a rapid fall by lysis. The eyes were first treated with 10 per cent solution of argyrol and later with merthiolate solution (1/1,000) and merthiolate ointment. In the third case the condition was treated with boracic lotion and ran a similar course. The author therefore expresses the view that the treatment had little effect on the course of the conjunctivitis. In each case examination four months after the illness showed the presence of a mild folliculosis.

DIAGNOSIS IN INTESTINAL OBSTRUCTION

In a review of one hundred and eleven cases of intestinal obstruction seen at the St Vincent's Hospital during a five year period, F J Morrin (*Irish Journal of Medical Science*, December 1943, 216, 615) discusses the difficulties of differential diagnosis. The general symptoms are pain, constipation, vomiting and abdominal distension. The severity of the pain, however, may vary greatly. With strangulation, especially if the onset is sudden, the pain is severe and accompanied by collapse. When acute obstruction supervenes on chronic stenosis the pain may not be severe; on the other hand in many of these cases of sudden obstruction the patient may complain of intense pain although there are no signs of collapse and the pulse and temperature are undisturbed. In such cases malingering or neurosis is often suspected, but delay in exploratory operation may have serious results. The pain of carcinoma of the distal colon is

usually in the right iliac fossa and suggests appendicitis. Another diagnostic point to be borne in mind is the difference between the symptoms of intussusception in children and adults, in the adult the symptoms are not so acute and the intussusception may exist for a considerable time before coming to operation. Constipation may be severe and yet obstruction not be present, and conversely, when obstruction is present the patient may not complain of constipation, in cases of intussusception diarrhoea is usually mentioned. Vomiting indicates obstruction of the small bowel, it may not occur with large bowel obstruction, and if it does is not feculent. Abdominal distension is exceedingly difficult to diagnose in the early stage, and a warning is given against waiting until visible peristalsis appears. The most valuable aid to diagnosis is the stethoscope, as attacks of abdominal colic are associated with a noisy turbulence which is unmistakable evidence of a blockage, in fact, the author states that the progress of a case may be estimated by auscultation alone. The X-ray picture of intestinal obstruction is easily read, although it does not show the cause of the obstruction:—Air is normally present in the stomach and large bowel and is apparent on the skiagram. The contents of the small bowel are not visible, but when obstruction is present air is visible within three hours of onset and the retained contents produce a series of crescentic shadows, the loop above the stenosis assumes the position of an inverted U. In large bowel obstruction, when evacuation of the lower bowel is procured by enemas, the empty distal bowel is seen in contrast to the air-filled loops proximal to the stenosis. If on first examination the accumulation of gas in the small intestine does not justify diagnosis, a second examination should be made in three hours. When strangulation is present the symptoms are usually severe, i.e., shock, fall of blood pressure or cardiac irregularity, and local signs in the form of tenderness and "rebound" tenderness on palpation.

THE USE OF LOW-DOSE IRRADIATION IN THE TREATMENT OF AMENORRHEA

A FURTHER report of the successful use of low-dose irradiation of the pituitary gland and ovaries in a series of ninety-two cases of amenorrhoea, the possibility of pregnancy first being eliminated by biological test unless the patient had recently menstruated, is given by C Mazer and Rose Greenberg (*American Journal of Obstetrics and Gynecology*, November 1943, 46, 648). Only patients who were physically well and who were proved not to be suffering from hypo- or hyperthyroidism or from pituitary adenomas were included in the

series The ages of the patients ranged from seventeen to thirty-six, girls under the age of seventeen and women over the age of thirty-nine were excluded in view of the facts of the immaturity of the ovaries in the first category and the phase of natural decline in the second In accordance with the size of the pelvis and the thickness of the abdominal wall a dose of 50 to 90 r measured in air was given and repeated three times at intervals of one week The pituitary gland was treated at the same time through a field of 5 by 5 cm just above and posterior to the midpoint of a line joining the outer canthus of the eye and the external auditory meatus Ten of the patients treated had not menstruated for a period of sixteen months to six years (average two years and eight months) Five of these patients, including one with total amenorrhœa for six years, menstruated following treatment during a follow-up period of one to five years, average three years Eight of twelve patients who had only menstruated at intervals of six months menstruated normally over a follow-up period averaging two-and-a-half years Fifty-two of sixty-eight patients with oligomenorrhœa, who before treatment menstruated at intervals of from two to four months, menstruated normally during a follow-up period of two years and seven months average for the entire group In fifty-four patients sterility was an important factor; thirty conceived at varying intervals after termination of treatment, twenty-eight being delivered at term of healthy infants, two aborted during the first three months of pregnancy All these women menstruated normally after the termination of pregnancy Endocrine dysfunctions were treated when necessary in conjunction with the irradiation therapy, and seventeen women with a history of prolonged uterine bleeding after variable periods of amenorrhœa were given injections of chorionic gonadotrophin, 500 I U daily for as long as the bleeding persisted, followed by subsequent low-dosage irradiation Control of the bleeding was accomplished in twelve cases but in only six of the seventeen was normal menstrual rhythm restored No spontaneous anovulatory cycles were observed in the treated series

AGRANULOCYTOSIS TREATED WITH SULPHADIAZINE

THREE cases of agranulocytosis due to sulphadiazine therapy in which treatment of the condition with large doses of the drug resulted in complete recovery are recorded by N Nixon, J F Eckert and K. B Holmes (*American Journal of the Medical Sciences*, December, 1943, 206, 713) The patients were aviation cadets aged twenty-two to twenty-six years One was

suffering from scarlet fever and two from virus pneumonia In two of the cases the patients were critically ill and not expected to recover when the sulphadiazine administration was reinstituted In one case, a cadet with scarlet fever, improvement had occurred after a first administration of sulphadiazine of 38 gm although the white blood count was falling Three days later the patient, who had been receiving liver extract and pentnucleoside, cevitamic acid and transfusions, became critically ill and was not expected to survive Sodium sulphadiazine was given intravenously in dosage sufficient to maintain the blood level at 20 to 25 mgm per 100 ccm After three days jaundice appeared and sulphadiazine was discontinued for one day and then resumed in dosage sufficient to maintain the blood level at 5 to 10 mgm per 100 ccm The next day the white blood count, which had ranged between 200 and 300, rose to 1,470, and immature granulocytes were present Four days later all evidence of blood dyscrasia had disappeared The patient made a good recovery In one of the cases of virus pneumonia the patient had improved after a total administration of 76 gm sulphadiazine Three days later there was a severe relapse with sudden drop in white blood count and abrupt rise of temperature The drug was resumed in dosage sufficient to maintain the blood level at 5 to 10 mgm per 100 ccm and continued for eight days A new consolidation of the lung had developed and the drug was stopped for two days The condition became worse and the patient comatose and deeply cyanotic, with auricular fibrillation and respiratory embarrassment due to congestive cardiac failure Some relief was obtained by repeated digitalization and oxygen, and sulphadiazine was resumed in dosage of 10 gm daily The next day there were signs of improvement, and six days later the white blood count, which during the period before the severe relapse had ranged from 130 to 1,050, rose to 14,150 During this third period of treatment a total of 150 gm sulphadiazine was given, the total for the whole period of illness was 290 gm In a fourth case, recorded in a footnote, in which a patient with moderately severe scarlet fever developed incomplete agranulocytosis after receiving 52 gm sulphadiazine in twelve days, the intensive resumption of sulphadiazine therapy was not resorted to and the white blood count recovered normally It is stated that only when severe infection is imminent should this sulphadiazine treatment be given Although in the recorded cases sulphadiazine was the drug responsible for the development of the agranulocytosis its use for the subsequent treatment of the condition is recommended, as of all the sulphonamides it is the least apt to cause toxic reactions.

REVIEWS OF BOOKS

The Surgery of Repair Injuries and Burns

By Squad-Ldr D N MATTHEWS, R.A.F.V.R., M.D., M.Ch., F.R.C.S. Oxford Blackwell Scientific Publications Ltd., 1943 Pp 386 Figures 198 Price 45s

THIS book falls naturally into four parts: the first deals with the immediate treatment of most soft tissues and of skeletal injuries of the face, though a section on perforating wounds of the chest and abdomen is included. The broad principles of the technique of treatment of wounds and skin losses is well stated. Perhaps the use of chemotherapy in clean wounds is advocated with more persistence than is justified. Parts two and three are concerned with the many aspects of subsequent repair. This is an enormous and a very difficult subject and its compression into 230 odd pages may account for the didacticism with which it is presented. Almost every plastic procedure is conditioned by so many factors, both local and general, that few dogmatic statements are acceptable. Part four is an up-to-date summary of the vexed question of burns. A full and unbiased statement of the present state of knowledge of both the pathology and the various methods of treatment available is perhaps one of the most valuable parts of the book.

4 Handbook on Difficult Labour By M. L.

TRESTON, F.R.C.S., F.R.C.O.G. Simla. Liddell's Printing Works, 1943 Pp 135 Illustrations 55 Price Rs 5

THE first edition of this little book on difficult labour never appeared, owing to the fact that all copies, blocks and type were destroyed by enemy action. In spite of this unfortunate beginning, the author has brought out the second edition in which some alterations have been made and two new chapters added. The main interest of the book lies in that it gives a good account of the author's experience in obstetrics in India, also the difficulties with which an obstetrician is faced in that country, and which he does not meet in England. The worth of the book must be considered in this light and it makes interesting and valuable reading. It cannot be considered in the light of a textbook for teaching purposes. For example, in discussing the treatment of placenta prævia, he mentions Caesarean section, and adds that "this last procedure is in my opinion the best, but it is rarely possible or practicable"—fortunately a state of affairs which seldom arises in this

country. The author gives an interesting list of statistics, and expresses the hope that this small book may be found useful in practice.

Sting-Fish and Seafarer By H. MUIR

EVANS London Faber and Faber Ltd., 1943 Pp 180 Figures 31 Price 15s

THIS is a remarkable book not only for its intriguing title, but for its generous supply of line drawings, valuable as a source of information and leaving in the reader's mind the impression of an obvious want supplied. The author was for forty years surgeon to the Lowestoft Hospital, and he uses his well-trained powers of observation for the study of an unusual and interesting subject. The intrinsic merits of the text are outstanding, and the reader is told of the beginning of the scientific study when the author was working in the pathological laboratory in the medical school of University College Hospital. In the present book reference is made to the widespread visits abroad in order to study the conditions of the weavers on the Continent, the Italian Riviera, Madeira, Madagascar and Mauritius. Among the twenty-four chapters interest attaches to those dealing with weavers and other sting-fish, in which an histological illustration of the "gland," showing the changes due to blood conditions caused by inoculation of weaver venoms, is included. Chapter IV deals with the spurdog or spiny spur. Other interesting chapters are those devoted to sponge-diver's disease and the treatment of wounds caused by venomous fish.

NEW EDITION

Surgery of Modern Warfare, Part III, edited by HAMILTON BAILEY, F.R.C.S., in its third edition (E & S Livingstone, 1951) is divided into three sections dealing respectively with wounds of the blood vessels, methods of immobilizing the limbs, and amputations. In the first section chapters dealing with the application of tourniquets, the use of the anticoagulant heparin, and arterio-venous aneurysms following gunshot wounds should prove of considerable interest. In the second section an attractive feature is the chapter on plaster technique, and in the third section much topical interest will attach to the illustrated discussion of the method of knee-plastic amputation and its value for the development of compensatory efficiency in the use of a prosthesis after amputation. The new edition is richly illustrated and will doubtless prove a popular number of the series.

NOTES AND PREPARATIONS

NEW AMPOULE SYRINGE

THE 'MONOJECT' BRAND AMPOULE SYRINGE has been devised for the use of the Forces in the field. It consists of a sealed collapsible tube with welded closure to which a hypodermic needle is attached, mounted in the nozzle. Sterility is ensured by a plastic cap sealed on to the nozzle of the tube. At present supply is limited to the Forces, but later it is hoped the syringe will be available for emergency civilian use. The manufacturers are Burroughs Wellcome & Co., 183-189 Euston Road, London, NW 1.

VITAMINS

A SECOND edition of *The Vitamins: A General Survey for the Practising Pharmacist*, has been published by the Pharmaceutical Society of Great Britain. Although designated for the pharmacist the information contained in this little book is of definite importance to the practitioner. The booklet is obtainable from the Pharmaceutical Press, 17 Bloomsbury Square, London, WC 1, price 2s 6d.

MENTAL DEFICIENCY AND ALLIED CONDITIONS

A COURSE of lectures on the above subject, arranged by the University Extension and Tutorial Classes Council in cooperation with the Provisional National Council for Mental Health, will, provided sufficient applications are received, be given at the London School of Hygiene and Tropical Medicine, Keppel Street, Bloomsbury, WC 1, from April 24th to May 5th 1944. Full particulars can be obtained from Miss Evelyn Fox, CBE, c/o University Extension Department, University of London, 39 Queen Anne Street, London, W 1.

MINISTRY OF HEALTH CAMPAIGN

WITH the object of increasing the campaign against spread of disease, the Ministry of Health have decided to issue a quarterly bulletin to pharmacists, the bulletin to be published as a four-page supplement to the *Pharmaceutical Journal*. The first bulletin, which comprises a foreword by Sir Wilson Jameson, KCB, MD, FRCP, Chief Medical Officer of the Ministry of Health, and articles dealing with venereal disease, droplet infection and measures for prevention, appeared in the issue of January 1st, 1944 (*Pharmaceutical Journal*, 152, 7). In view of the numbers of people who seek advice at chemist's shops this new venture should considerably increase the scope and usefulness of the campaign.

OFFICIAL NOTICES

The Organization of a Hospital Rehabilitation Department (Emergency Medical Services Memorandum, no. 6) deals with the general scope of rehabilitation facilities in F.M.S. hospitals and also gives particulars of courses for members of the staff. Copies can be obtained from H.M. Stationery Office, price 2d. *The Liver Extract (Regulation of Use) Order, 1944*, limits the use of liver extract, including desiccated liver, to the treatment of pernicious or other megalocytic anemias. The only forms of liver extract which may be used for these purposes are injectable liver extract and proteolysed liver extract. The Ministry of Health's issue on the subject obtainable from H.M. Stationery Office, 1d. *National War Formulary and Drug T* issued by the Ministry of Health, relates to renewed availability of tincture of belladonna for dispensing preparations in the second extension of the National War Formulary, and also to extension to August 1, 1944 of the period during which alternative formulæ for the ointment the B.P. Addendum VI may be used.

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INDIGESTION AND NATIONAL HEALTH

By SIR ARTHUR HURST, D M, F R C P

Consulting Physician, Guy's Hospital, and Physician (temporary), Radcliffe Infirmary, Oxford

THE constant anxiety of the years between the two great wars, which led to the steady rise in the incidence of gastric disorders, can be fully realized only by those whose memories go back to the care-free days before 1914. National and personal security should lead to a corresponding fall in the incidence of inflammation, ulcer and cancer of the stomach. Freedom from anxiety will also do much to reduce the incidence of alcohol and smoking. Freedom from want will lead to the provision of better food, and widespread education of young women in domestic science should lead to better cooking. Improved conditions of labour will prevent overworking of meals. Together with the provision of adequate holidays it will also prevent their consumption when digestion is inadequate as a result of fatigue.

GASTRITIS, GASTRIC ULCER AND GASTRIC CARCINOMA

Carcinoma never develops in a normal stomach. It is invariably caused by malignant degeneration of a chronic ulcer or of the unhealthy mucosa in chronic gastritis. Both chronic ulcer and chronic gastritis are the result of long-continued irritation of the mucous membrane in people with a constitutional tendency to develop gastric disorders. One type of gastric inferiority predisposes to ulceration, a second type to gastritis. In the former, acidity is high or normal, in the latter it is low or absent. The irritation may be mechanical or chemical. The chief mechanical irritants are food which has been insufficiently chewed as the result of hurrying over meals, deficient teeth or badly fitting dentures, and food which is coarse or badly cooked. The chief chemical irritants are condiments, alcohol taken on an empty stomach, and swallowed tobacco juice.

The effect of mechanical and chemical irritants is greatly aggravated by anxiety and fatigue.

The recent investigations of Wolf and Wolff on "Tom," the modern Alexis St. Martin, whose gastric fistula they observed in varying emotional states, have demonstrated that anxiety leads to increased secretory and motor activity associated with congestion of the mucous membrane. The engorgement may be so intense that the appearance is indistinguishable from what gastroscopists have hitherto diagnosed as hypertrophic gastritis, which is in fact a rare condition, though frequently simulated by the congestion caused by the anxiety associated with the examination. Wolf and Wolff further discovered that the congested mucosa was much more vulnerable to slight mechanical and chemical irritation than the comparatively thin and pale mucosa seen when Tom was happy and contented.

It is clear that carcinoma of the stomach should be a preventable disease. If there were no gastric ulcer and no gastritis there would be no carcinoma. The ulcer diathesis and the gastritis diathesis are constitutional and cannot be prevented or overcome. But if the exciting causes, mechanical and chemical irritation, and the predisposing causes, anxiety and fatigue, are avoided, no ulcer and no gastritis will develop.

A dentist is needed for every two thousand inhabitants of this country in order to keep their teeth in good condition, provided that each dentist has a dental hygienist to assist him. This means that the number of dentists—men and women—must be increased to 23,000, and 23,000 girls must be trained as hygienists, whose duty it will be to scale the teeth and instruct both adults and children in oral hygiene. This will leave the fully qualified dental surgeon, who superintends their work, sufficient time to treat teeth conservatively instead of performing wholesale extractions. There is no reason why, with adequate dental and adequate dental attention for people of all ages and not only the young, the teeth should not be preserved to old age. The incidence of carcinoma of the stomach in the poor would then no longer be double that in the well-to-do, although the total incidence of cancer is the same in all classes. Their stomachs are alike at birth. It is therefore an extrinsic cause which leads to the high incidence of cancer in the poor, and the only extrinsic cause which is present much more frequently in the poor than in the well-to-do is the deficient mastication which results from insufficient teeth, badly fitting or deficient dentures and, among the very poor, often no dentures at all.

There is thus a unity in the causes and in the prophylaxis of organic gastric disorders. Social security resulting from freedom from anxiety and freedom from want and improved education should lead to their gradual elimination. No greater contribution could be made than this to the cause of national health.

GASTRIC AND DUODENAL ULCER

More patients are admitted into British hospitals at the present time for gastric and duodenal ulcer than for any other condition. A considerable proportion have been previously treated in hospital for the same condition once, twice, or still more frequently. There are two reasons for this unsatisfactory state of affairs: a large proportion of patients with ulcer are discharged from hospital long before healing has occurred, and the instructions given to them concerning the precautions they must take in order to prevent a recurrence are totally inadequate. Symptoms generally disappear so rapidly with rest in bed and simple dieting that it is too often assumed that the ulcer has healed in two or three weeks, and no steps are taken to ascertain whether this is in fact true. The shortage of hospital beds and the little medical interest of cases of ulcer under treatment prompt the house-officers to get rid of them at the earliest possible moment. The result is that soon after the patient returns to the conditions under which his ulcer originally developed, it becomes active again. If, in contrast with this, he is kept on the strictest treatment until all the evidence points to complete healing, a new ulcer is much less likely to develop.

The high incidence of gastric and duodenal ulcer will not be materially reduced

until every town hospital is provided with a country annexe for the treatment of chronic diseases. A patient with ulcer will then be taken into the central hospital for diagnosis and the first fortnight of strict treatment, after which he will be transferred to the country to continue the treatment in bed for as many weeks as are likely to be necessary for healing to occur. At the end of this period he will return to the central hospital for re-examination, and will then be sent for a final period to the country for more strict treatment if healing is still incomplete, the treatment in any case ending with a fortnight's rehabilitation, during which he gradually returns to activity and learns the post-ulcer regime.

The strict treatment should consist in mental and physical rest with frequent non-irritating feeds, together with such alkalis as magnesium trisilicate and aluminium oxide, and atropine in maximal doses when the acidity is high or pain persistent. This should be continued until all spontaneous pain has disappeared, there is no tenderness or rigidity, no occult blood in the stools, and the X-rays show no trace of an ulcer crater, and in no case for less than four weeks. Often six or eight weeks are needed to secure complete healing, and for large gastric ulcers still longer. In the case of gastric ulcers a gastroscopic examination should be made about a fortnight after the last trace of the "niche" seen with the X-rays has disappeared, as experience shows that at least this time must elapse before a round scar has replaced the granulations filling the niche.

Reference has already been made to the gastric diathesis which predisposes to gastric ulcer. A quite different type of stomach, the characteristic features of which are hyperchlorhydria and rapid evacuation, predisposes to duodenal ulcer. It is futile to give a patient with an ulcer a period of strict treatment if steps are not taken to prevent its recurrence on returning to work after it has healed by giving him a regime which he must follow for the rest of his life. It should be explained to him that his recent illness is the result of a constitutional tendency, and that a recurrence is almost certain to occur if he returns to the conditions of life which preceded its onset. However long he remains free from symptoms he must keep to the new regime, as he will never outgrow the constitutional tendency, which is as much a part of him as his external appearance. I tell such patients that if they ever have a recurrence it will certainly be either their fault or mine—theirs if they have not kept to the rules, mine if they have. If it is my fault, I shall have to give them a better planned regime, but I can tell them beforehand that the chances are at least ten to one that it will prove to be their fault, not mine.

I have drawn up a post-ulcer regime, which has been revised from time to time during the last twenty-five years, and especially recently in order to fit in with war-time conditions. It differs materially from most regimes, which are given to patients leaving hospital after a period of strict treatment for ulcer or after operations for ulcer, as comparatively little attention is paid to details about what they may and may not eat compared with how and when they should eat, and attention is drawn to other important factors, such as fatigue, anxiety, infections and tobacco. It is of course essential to discuss the regime in detail with each individual patient and modify it, when necessary, in the light of his own past experience as to the factors which have preceded the onset of his attacks of active ulceration. It is also important to remember that whereas extrinsic factors are of special importance in

gastric ulcer, psychological factors are generally of chief importance in duodenal and anastomotic ulcers. In hospital the regime should be explained by the physician or his house-officer, and not by the dietitian, whose interest is likely to be concentrated on the relatively unimportant details of diet. It is also much better to tell a patient what he should avoid rather than to give him standard meals, which are often quite impossible for him to obtain.

It is quite easy to arrange for the two-hourly feeds in almost every civilian occupation, with the help of the two pints of milk allowed to "ulcer patients" and the occasional addition of their sweet ration in the form of plain chocolate and biscuits when obtainable. A lorry driver, farm labourer or clerk can take the milk with him in a bottle and have a drink as often as necessary, so that it does not matter if, in the case of the lorry driver, for example, dinner is taken at irregular hours and long periods elapse between proper meals.

The note about drugs in tablet form is of special importance if a patient has had a hæmorrhage, as aspirin is much the most common cause of hæmatemesis in the absence of other gastric symptoms. It is also occasionally the cause of hæmorrhage in patients with a chronic ulcer.

POST-ULCER REGIME

TO BE FOLLOWED PERMANENTLY

- (1) A meal or feed (milk, plain biscuit or plain chocolate) should be taken at intervals of not more than two hours from waking to retiring, and again whenever you wake during the night.
- (2) Eat slowly and chew very thoroughly. Adequate time should be allowed for meals, which must be punctual. Avoid taking a meal when you are tired, first rest for at least a quarter of an hour. When there is no time for a proper meal, it is better to drink some milk or eat some plain chocolate or biscuits than to bolt some less digestible solid food.
- (3) Do not smoke more than six cigarettes or two pipes a day, and these should be after meals. Cigarettes should have an absorbent plug in the mouthpiece. Do not smoke at all if you have any indigestion.
- (4) During periods of overwork, and especially of mental stress, whenever possible a day or half-day a week should be spent resting in bed or on a couch, or lying out doors, on a strict hourly or two-hourly diet, even in the complete absence of digestive symptoms. If you are much worried or sleeping badly, ask your doctor for a sedative.
- (5) Special care should be taken to avoid chills. If you get a cold, sore throat, influenza or other infection, remain in bed on a very light diet until you have completely recovered.
- (6) Avoid alcohol, except (if desired) a small quantity of beer, light wine or diluted whisky with (but never before) meals. Avoid pips and skins of fruit (raw, cooked or jam, and raisins, currants, figs, ginger and lemon-peel in puddings and cakes), and unripe fruit. Avoid radishes and raw celery, tomato skins, stringy French beans, hard peas and beans. Coarse green vegetables (cabbage, etc.) must be passed through a fine sieve. Avoid porridge made with coarse oatmeal, wholemeal and similar biscuits, tarts, meat, mustard, pepper, vinegar, curry, pickles and chutney. If in doubt about any food, remember you must not eat anything which cannot be chewed into a mush.
- (7) A teaspoonful of magnesium trisilicate or aludrox should be taken an hour after meals and also whenever the slightest indigestion or heartburn is felt.
- (8) Isogel or liquid paraffin may be taken for the bowels, if necessary, but no other aperient should be used.
- (9) Visit your dentist regularly every six months.
- (10) Take no drugs, such as aspirin, in tablet form.
- (11) If you have the slightest return of symptoms, go to bed on a strict diet at once. Consult your doctor and do not wait for the symptoms to get serious.

PEPTIC ULCER

BY SIR HENRY TIDY, KBE, DM, FRCP

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PEPTIC ulcer came into prominence as a serious practical problem in the second half of the nineteenth century. Attention became directed to the frequency of acute gastric ulcer, associated with perforation or hæmorrhage, in girls and young women under the age of thirty-five years. The catastrophe might or might not be preceded by a comparatively short period of pain after food. Either a catastrophe occurred or the ulcer healed: it did not linger on into later life as a chronic ulcer. This type of acute ulcer probably began to be prevalent between 1820 and 1840, and for several decades the number of deaths resulting exceeded those from all other groups of peptic ulcer. By 1900 the incidence was diminishing rapidly and shortly afterwards two other groups of peptic ulcer came into view. Chronic gastric ulcer became more frequent and affected both sexes and all ages, but usually males, and especially in the later decades of life.

An even more spectacular event was the arrival of duodenal ulcer. It was noted from the first that it occurred predominantly in males. The diagnosis was based almost solely on the observation of melæna associated with some form of upper abdominal pain. Moynihan then began his battle for the earlier and more general recognition of duodenal ulcer and described the clinical manifestations in addition to those of melæna and hæmatemesis. It is often thought that Moynihan distinguished an entity which had been previously overlooked. This is not quite correct. Moynihan's campaign coincided with the rise of duodenal ulcer from a rare to an everyday occurrence.

No increase in the incidence of peptic ulcer was observed during the war of 1914-18, either among civilians or in the Services. Medical officers in France specifically noted its rarity. There is no reference to peptic ulcer in the text of the *Medical History of the War*, and the title of duodenal ulcer does not appear in the tables of statistics.

There is no doubt that the incidence of peptic ulcer increased enormously between the two wars, especially in males. Little attention was paid to it; an occasional article appeared on the subject. Physicians in out-patients' departments groaned when they tried to teach students on a succession of doubtful ulcers, and hospital radiologists complained of the number of cases sent to them. But in general the profession did not grasp what was happening.

Consequently the medical profession was surprised by the flood of cases of peptic ulcer in the Services which began within a few weeks of the outbreak of war, especially among reservists recalled to the Army. It was thought at first that the cases were new developments of peptic ulcer caused by deficiencies in Army cooking. But Newman and Payne (1940) showed that nearly all cases were recurrences of ulcers which had existed in civilian life. It is now agreed that there is

no evidence of any excessive development of fresh ulcers in the Services. The Army had already learnt by experience that even in peace time the presence of a peptic ulcer is inconsistent with the proper execution of the duties of Army routine, and it was a regulation that men so suffering should be invalided out of the Service, except in the case of a few key men. Unfortunately civilian practitioners drafted into the Army as medical officers at the beginning of the war were usually unaware either of this experience or of the regulation. Many hospitals attempted to effect "cures" by treatment and then returned the men to their units as fit for general duty or, even less satisfactorily, as fit for light duty only. The attempts failed, recurrences almost invariably followed and for a period there was considerable confusion and much loss of time. Gradually the correct principles for treatment and disposal became generally understood and the position was satisfactorily controlled.

In the German journals accessible in this country during the war there have been few articles on peptic ulcer, but it is evident that the experience as regards the increase of this disorder in Germany has been similar to that in this country. The rarity in 1914-18 is noted and the increase between the wars. The increase in incidence in the Services during the war has been almost entirely due to recurrence of pre-war onset. Opinions are divided as to whether there has been any increase among civilians or in the Forces. The interesting statement is made that the incidence is much higher among non-fighting than fighting troops.

ETIOLOGY

The causes of the development of peptic ulcers are still obscure. A few years ago great attention was paid to the free HCl in the stomach contents but it is possible that this is an exciting stimulus or a concomitant feature rather than an essential cause. There are undoubtedly families in which there is an hereditary predisposition, but heredity alone cannot explain the recent increase in the incidence.

The course of gastric ulcer in girls and young women is of interest in this connexion. It was common in the Victorian age and now is practically non-existent. Obviously this course must have been independent of psychological influences although psychological stimuli may have been the exciting cause for individual perforations and hæmorrhages. Nor can heredity be involved. Nor can tobacco, for the Victorian girl would not have dared to smoke. The modern girl smokes to excess, especially on an empty stomach but she rarely gets a gastric ulcer. Clearly there must have been external factors during that period which acted on young women but not on young men, who almost escaped. It is tempting to connect the disappearance of this type of ulcer with the disappearance of chlorosis, but the causes could not have been identical for there is no evidence that chlorotic girls were prone to ulcers. Nevertheless, it is not impossible that the causal factors were related.

The ulcers of this group were undoubtedly acute ulcers. Knowledge of the relationship of acute and chronic ulcers is imperfect, and it is doubtful if it is merely a matter of duration. It is an old observation that symptoms may suggest an acute ulcer whilst operation reveals a chronic form. The recent investigation of Wolf and Wolff (1943) on the "new Alexis St. Martin" have shown that the

appearance of a chronic ulcer can be produced in four days and the stomach return to normal in a further five days. Their observations are also of interest in regard to the relationship of gastritis to ulceration. Nevertheless, there may well be different causes for what have been regarded as acute and chronic ulcers and even more probably for gastric and duodenal ulcers.

Psychological stimuli can undoubtedly induce the onset or more often the recurrence of symptoms and precipitate a perforation or a hæmorrhage. But whilst it is evident that such stimuli can pull the trigger, it is improbable that they can load the gun. Thus the incidence of peptic ulcer in the Victorian age was greatest in young girls, whereas the increase between the wars was mainly in males.

The valuable study by Stewart and Winsor (1942) proved that the incidence of perforation rose rapidly during the severe air raids on London. This observation has been confirmed for other parts of the country, and it has also been found that less marked rises occurred at the onset of war, at the time of Dunkirk, and at other periods of crisis. The percentage of males among these was as high or even higher than in peace time. Thus in Bristol 98 per cent. of the perforations were in males (personal communication from J. Rendle-Short). Women, however, are not entirely immune to these psychological stimuli. At the height of a severe and prolonged air raid on a provincial city, the harassed surgeons of a military hospital were exasperated by a young V.A.D. in whom an ulcer perforated without any previous symptoms. It would appear that some predisposing factors now exist which especially affect males, whereas in the Victorian age there were factors especially affecting young females. While such factors are active, psychological influences may become exciting stimuli.

DIAGNOSIS

The diagnosis of peptic ulcer depends on consideration of the symptoms, physical examination, radiography, examination of gastric contents and fæces, and gastroscopy. The outstanding symptom of an active duodenal ulcer is the well-known "hunger pain," characterized by the punctuality with which it arrives, its occurrence at night and its relief by food and antacids. In the early stages it is often not more than a discomfort or may be merely a "sinking sensation." The site varies, but it is most often felt in the epigastrium to the right of the middle line or high up in the costal angle. Waterbrash is a suggestive symptom, but too much reliance must not be placed upon it. Evidence of hæmorrhage will frequently clinch the diagnosis, it may be revealed by mælena, occasionally accompanied by slight hæmatemesis or by the development of anæmia.

On *physical examination* the recti, especially the right, are often on guard, and may be tender. On deep palpation there is tenderness over the site of the ulcer. This sign is often elicited more successfully by the radiologist than by the physician and there is no doubt that the radiologist has several special advantages. In the first place he can locate the duodenum on the screen and hence knows where to palpate. Secondly, he is in the best position for deep palpation of the abdomen, the patient being erect and directly before him. Thirdly, and most important, the patient has no suspicion that his abdomen is about to be palpated. The unexpected thrust by the radiologist carries his fingers deep into the abdomen.

while the muscles are still relaxed. The physician can partly reproduce these conditions by auscultating the heart in the erect posture and suddenly palpating the abdomen with the left hand.

Radiography is often definite and decisive. The presence of an ulcer crater together with the symptoms may leave no doubt as to the diagnosis. But the duodenum is a small area and difficulties are not infrequent. A healed ulcer leaves a permanent scar, and hence a deformed duodenum is not proof of the presence of an active ulcer, whilst, on the other hand, an ulcer may heal without leaving any definite deformity. Again, the presence or absence of a crater of an active ulcer is not always easy to determine and an inexperienced radiologist may easily make an erroneous decision. The combination of a physician and a radiologist both in doubt is too often interpreted as establishing the presence of an ulcer.

Confusion is caused at present by the different meanings attached to the term "duodenitis," and its relation to symptoms exactly or partly resembling those of a duodenal ulcer. Radiologists are not in agreement among themselves, and physicians on the whole are sceptical as to the justification for the diagnosis. Most certainly it should not be used as an easy way out in cases in which the presence of an ulcer is doubtful.

Gastric analysis now takes second place to radiography. The fasting juice is increased in amount and may be 50 to 150 c cm. The acidity is above normal, often high, and is rarely less than 0.1 gm per cent. After a histamine injection the rise is rapid and may reach 0.4 gm. With a fractional test meal the rise is slower, forming a "climbing curve" and rarely exceeds 0.35 gm. Unless the acidity is definitely above the usually accepted normal limits the presence of a duodenal ulcer is improbable, but a high acidity is not proof of its presence.

The results of the *examination of faeces* for occult blood are at present unreliable. When all the accepted precautions have apparently been followed, it still occurs that one hospital will obtain a high percentage of positive results and another hospital an equally high percentage of negatives, and neither may bear any close relation to the established presence of peptic ulcer. Why this should be, it is impossible to say. Several careful studies have been made of the method, but it would appear that some investigation of the discordant results is indicated, if the test is considered worthy of being explored. Until similar results are obtained by equally competent pathologists using the same technique, and these are correlated with the presence of an active peptic ulcer, the test must be regarded as unsatisfactory.

Gastroscopy at present does not enter greatly into the diagnosis of duodenal ulcer. In spite of these difficulties it does not appear that a duodenal ulcer is often missed in a case under investigation. On the other hand, the diagnosis is not infrequently made on insufficient evidence, especially by inexperienced radiologists.

GASTRIC ULCER

Gastric ulcer is a more serious condition than duodenal ulcer and the diagnosis is more difficult. It is easy to draw a clinical picture of an unmistakable ulcer

is epigastric pain closely related to taking food, vomiting relieves the pain, hæmatemesis may have been observed. The skiagrams show a characteristic notch in the lesser curvature. The patient is afraid to eat, and the nutrition suffers. It is by no means uncommon to meet cases which possess all these features, but many cases are not so distinctive and surgery has shown how often the diagnosis may be at fault. Physical examination and gastric analysis may be of little help, or tenderness and muscular rigidity may be slight and the acid often ranges round normal. Antacids may give only partial relief.

It is here that the gastroscope becomes increasingly useful. It may be hoped that gastroscopy will become a routine in the investigation of gastric ulcer, although it should not be allowed to replace radiography, which give a valuable permanent record at various intervals after an opaque meal.

TREATMENT

The *medical treatment* of uncomplicated peptic ulcer has attracted the close attention of highly competent observers of great experience over many years. Elaborate schemes of diet have been composed, and minute directions on a printed sheet may be handed to a patient on his return home from a course of treatment after full explanations from a conscientious dietitian. It is disconcerting to find how frequently the most prized idol of an expert, the corner-stone of his edifice, is ground contemptuously to powder beneath the heel of an equally competent confrere. Too much attention is commonly paid to details. The carefully graduated diets of a few years ago have largely been swept away and with them should go the frills which still decorate such directions.

The first essential of treatment during acute stages is rest in bed. The rest should be both physical and mental, so far as possible. The second principle, to be continued subsequently for a period not to be defined, is that food should be taken at intervals not exceeding two-and-a-half hours and in the earlier stages not exceeding two hours. The third principle is that the diet should be ample in amount, mixed, and include at least 2 pints of milk and a sufficiency of vitamins. At the onset of treatment there must be some graduation in quantity but no elaborate scheme is necessary. Any ordinary item of diet is permissible which can be chewed into a liquid form.

Antacids should be given during treatment, especially in cases of duodenal ulcer. There is a wide choice which may be left to the discretion of the practitioner, or there is little evidence of substantial advantage for any one of them. A preference may be expressed either for aluminium hydroxide or simple carbonates. It is wise to continue antacids subsequently, especially for duodenal ulcer, but they must not be considered to permit long intervals between food.

When a patient relapses, it is common to hear that he has, as he may put it, relaxed his diet. Frequently he has returned to his former irregular meal-times while adhering tenaciously to the direction to take fresh green lettuce but never cabbage, or vice versa as the case may be.

The case against tobacco is strong, but not conclusive. Until it is exonerated, smoking should be forbidden entirely during active treatment and subsequently restricted to forty minutes after the chief meals.

THE RÔLE OF SURGERY IN DYSPEPSIA OF EXTRA-GASTRIC ORIGIN

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IT would be impossible in a short article to deal with more than a few of the many surgical conditions which may, in one way or another, lead to gastric dysfunction, nor would anything be gained by considering those in which dyspepsia is only a secondary feature of an obvious local disease. The following remarks will therefore be confined to pathological states of the abdominal viscera outside the stomach in which the local signs may be insignificant as compared with those of the reflex gastric disorder.

There is abundant evidence of the close correlation of movement and secretory activity between the different parts of the digestive tract, the normal functioning of each individual part depending upon the proper working of the whole, and the failure of function at one level causing its dislocation at another. Of all parts of the alimentary canal the stomach is the most susceptible to the influence of stimuli from outside its walls, and its disorders the most apparent to its owner, so that it is not surprising that dyspepsia is so common a symptom of disease elsewhere. The assessment of the value of dyspepsia as a diagnostic symptom of any particular region may, however, be difficult, owing to the fact that the forms which it takes are not by any means specific and seem to depend as much upon the individual characteristics of the patient as upon their exciting cause. Moreover, exactly similar gastric symptoms are often the main features of psychoneurotic states having no organic disease as a background, and it is precisely at the periods of life when such psychic states are chiefly met with that dyspepsia of obscure origin within the abdomen most commonly occurs. The whole subject is, of necessity, a nebulous one and does not lend itself to the formation of precise rules for diagnosis or treatment, and the object of this article is not so much to paint detailed clinical pictures as to draw attention to the dangers of over-estimation of the value of certain physical signs and methods of investigation, and of accepting the existence of pathological states of which little or no confirmatory evidence is forthcoming, and which common sense must suggest are highly improbable. The matter is one of far-reaching importance because, since laparotomy has been rendered a relatively safe procedure, the habit of regarding vague abdominal symptoms, often on the most slender grounds, as incriminating such organs as the appendix and gall-bladder, has spread alarmingly, and every experienced surgeon must have watched with disquietude the growing number of people from whom one or both of these have been removed with either no amelioration or with exaggeration of their malady. Such operations can only bring discredit to the medical profession, and every effort should be made to prevent their occurrence.

As has already been said, the following survey is not intended to be complete, and it is proposed to select only a few of the better known examples of the so-called

'surgical dyspepsias,' and to criticize views, still widely held, which appear to be responsible for much unnecessary, and therefore bad, abdominal surgery

THE GALL-BLADDER

Chronic cholecystitis, with or without gall-stones, is probably the most common outside cause of gastric symptoms. The typical case, with its flatulent dyspepsia, eructation, distaste for certain foods, and characteristic colic, pain in the back and in the gall-bladder region, is fully described in the textbooks, and there is no difficulty in either the diagnosis or the choice of treatment. It is only necessary to consider the more obscure case in which the classical signs are lacking and the diagnosis is in doubt. Characteristic colic is absent, definite tenderness of the gall-bladder is not easily demonstrable, and the gastric symptoms are inconclusive. In such cases recourse is usually had to X-ray examination and it is essential to know what reliable information can be obtained by this means.

X-ray examination—Visualization of the gall-bladder after opacol administration will demonstrate the presence of stones or of deformities of the gall-bladder resulting from fibrous contractures or adhesions, and if a manual examination is made on the X-ray table it may be possible to elicit tenderness which had been missed clinically owing to abnormal position of the gall-bladder. Inability to procure a shadow after repeated attempts is strong evidence of advanced inflammatory change, but here the value of X-rays ends, and variation in the depth of the shadow and in the rate of filling and emptying are not reliable evidence of disease, since they depend upon so many factors, psychic or otherwise, which are almost impossible to eliminate.

Another confirmatory test of which much was hoped some years back was the *examination of bile* aspirated from the duodenum after removal by irrigation of its contents and injection of magnesium sulphate to provoke a flow of bile. The presence of bacteria, epithelial cells and an excess of mucus was held to be direct evidence of active cholecystitis, but experience showed that there was no means of proving that the fluid thus aspirated was necessarily from the gall-bladder, and the method fell into disrepute.

The doubtful cases of chronic gall-bladder disease are almost always in women of the menopausal age, and in them by far the most common cause of dyspepsia is the nervous upset inseparable from this period of life, and the problem is a psychiatric and not a surgical one.

It must not be inferred from the foregoing that an exploratory operation is never justified in the absence of unequivocal signs of cholecystitis. Occasions must arise from time to time when symptoms persist after prolonged medical and psychiatric treatment, and in spite of full investigation its possibility cannot be excluded, but they are rare. If, in these circumstances, the abdomen is opened and the gall-bladder appears healthy to the naked eye and no stones can be felt through its walls, the opportunity should of course be taken to examine the other organs for signs of disease, and if none is found the abdomen should be closed without more ado. A gall-bladder, the wall of which is not abnormally thick or opaque and is not adherent to neighbouring viscera, is not the seat of chronic inflammation and there is no excuse for removing it, nor is the slight thickening

parts of the body During the attacks the appendix is somewhat swollen and hyperæmic and its mucous membrane is thick and soggy Often the lowest few inches of the ileum are similarly affected The neighbouring glands are moderately enlarged and light pink in colour, but the peritoneum is not affected Between the attacks the appendix is less swollen, but firmer than normal to the touch, and the glands remain enlarged

The *clinical picture* in small children is one of repeated "bilious attacks" with raised temperature, lasting for a day or two at a time, and there may be only slight local symptoms, although tenderness and guarding in the right iliac fossa can always be elicited Some alteration in the bowel habit is usual, and there may be either constipation or diarrhœa Between the attacks the child is apt to be less spirited, capricious in its appetite and to show signs of abdominal discomfort, avoiding games, and so on In adults and older children the gastric symptoms are less in evidence, although nausea and vomiting may occur during the exacerbations and the appetite may be poor between them The local signs, however, are more marked and pain in the iliac fossa is more constant at all times

Although in some cases the lymphoid tissue of the ileum is inflamed as well as that of the appendix, there is no doubt that the symptoms disappear after appendicectomy, and this is clearly the best treatment

APPENDICULAR COLIC—It is doubtful whether colic resulting from concretions ought to be placed among the dyspepsias, but as the pain is sometimes felt in the epigastrium and may, when severe, give rise to nausea, it should perhaps be included The pain is sharp and fleeting in character and is usually felt locally or at the umbilicus, or occasionally above it Tenderness on pressure over the appendix can generally be elicited, and X-rays may be of assistance in localizing it Occasionally, if of long standing and infiltrated with calcium salts, the concretion is visible in an X-ray film The treatment is appendicectomy

As in the case of the gall-bladder, dyspepsia due to disease of the appendix occurs during a period of life in which functional nervous disorder is extremely common, only in the case of the appendix the period is that of youth and early maturity, and it cannot be too strongly emphasized that dyspepsia at this age, in both sexes, is in the vast majority of cases attributable to neurosis and only rarely to the appendix

The term "chronic appendicitis" is ambiguous and ought to be deleted from the nomenclature of diseases, and appendicectomy for dyspepsia should be reserved solely for the lesions described, which are not as a rule difficult to diagnose

OBSTRUCTIVE LESIONS OF THE INTESTINES

There remains to be considered a group of cases in which the dyspeptic symptoms are the effect, probably through pyloric spasm, of partial or intermittent obstruction of the intestines This may be due, as in the case of appendicitis or inflammatory disease in other situations, to local spasm of the gut wall, or to a number of mechanical causes, such as intestinal tumours, fibrous contractions of ulcers or peritoneal adhesions In some cases the history of an abdominal operation or of peritonitis in the past may be a clear pointer to adhesions, or one of tuberculo-sis or, occasionally, of a strangulated hernia may suggest the possibility of a cic-

rising ulcer, and lead to a careful X-ray investigation, but with others there may be nothing in the history to suggest a cause, and for this reason it may escape detection, with serious results. For instance, it is not perhaps widely enough appreciated that gastric upset is not uncommonly the earliest symptom of intestinal carcinoma, and many a rectal growth has been allowed to reach a stage of inoperability because persistent epigastric discomfort, flatulent dyspepsia and loss of appetite directed attention only to the upper abdomen. In the colon and rectum a partial obstruction may cause little or no local symptoms, but in the case of the small intestine, colic is almost always a marked feature, although it may give a very imperfect clue to the precise localization of the lesion.

The following three cases illustrate, on the one hand, the danger of delay in making a thorough investigation and, on the other, the difficulty of arriving at a correct diagnosis in spite of it —

(1) A girl aged fifteen was treated for a year for recurrent "bilious" attacks accompanied by intestinal colic, loss of appetite and rapid loss of weight. At last she suddenly became acutely ill and was admitted to hospital with all the signs of general peritonitis, which was found, at operation, to be the result of chronic stenosing enteritis (Crohn's disease) of the middle of the ileum, with a mesenteric abscess which had burst into the peritoneal cavity. The operation was too late to save her life.

(2) A woman aged thirty had for several years been subject to attacks of vomiting accompanied by colic felt to the left of the umbilicus. Repeated X-ray examinations failed to demonstrate an obstruction, but the frequency of the attacks and the fact that the pain was always felt at the same spot decided me to explore her abdomen. Operation disclosed a Meckel's diverticulum adherent by its tip to and sharply angulating the ileum. The symptoms subsided at once after the removal of the diverticulum.

(3) A girl aged nineteen was admitted with a history of repeated attacks of colic felt mainly in the region of the transverse colon accompanied by nausea and sometimes by vomiting, for which first her appendix and then her gall-bladder had been removed. The attacks persisted and finally a barium enema disclosed a delay in filling at the pelvi-rectal junction. At the operation the whole of the sigmoid portion of the colon was found to be thickened by hypertrophy of its muscle, presumably as the result of neuro-muscular incoordination at the pelvi-rectal junction. Excision of the sigmoid loop resulted in a complete cure.

The points to be stressed are that in the elderly the possibility of obstructing growths of the bowel being the cause of gastric symptoms should always be borne in mind, that repeated attacks of localized intestinal colic are nearly always a sign of organic obstruction and should lead to thorough investigation by barium meal and enema, and, finally, that even if X-rays fail to demonstrate an obstruction, persistence of the attacks is a call for abdominal exploration.

Mention has been made above of peritoneal adhesions, and it should be made clear that these only require surgical treatment when they are definitely causing obstruction. The practice of reopening an abdomen to divide post-operative adhesions in the hope of relieving persistent discomfort has now happily been abandoned. Such operations, like those performed for ptosis of the abdominal organs, only serve to create, or more often to intensify, a neurotic state which makes these patients a burden to themselves and to all around them.

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INDIGESTION DURING PREGNANCY

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THE term indigestion of pregnancy can be taken to include any deviation from the normal gastric and intestinal functions which are met with in the course of an otherwise uncomplicated pregnancy

For descriptive purposes there are two main groups morning sickness, or early vomiting of pregnancy, and indigestion, such a division results from chronological occurrence and custom, derived from certain differences between the symptoms experienced in the early months as compared with those of the later months. It would appear that they are stages of one single condition and will be taken as such in discussing causation, further research may, however, prove them to be separate entities

ETIOLOGY

The etiology of indigestion of pregnancy is little understood and no organic or other satisfactory explanation has yet been evolved. The different theories which have been put forward may be listed as —

(1) *Neurosis* — There is no doubt that the highly-strung, neurotic or unbalanced patient is liable to suffer much more severely than those who are more placid, but this applies to almost any illness in which subjective symptoms are pre dominant. Moreover, it is not by any means uncommon to meet with severe suffering in those whom no one has regarded as being neurotic beforehand. There may be examples of pure neurotic vomiting, but this is not proved merely by the cessation of symptoms under treatment of the Weir Mitchell type rest from physical exertion, household worries and so on, together with suitable feeding, may easily cure by allowing the system to adjust itself to the demands of pregnancy. It is also a dangerous theory, in that too close adherence increases the likelihood of more serious causes being overlooked

(2) *Toxæmia* If toxæmia is taken in its usual sense there is little support for this theory, since, even in the most severe cases of ordinary vomiting, e.g. those which do not eventually prove to be hyperemesis gravidarum, no clinical, pathological or chemical evidence can be found of such condition. It is, however, of course, quite possible that some substance may be produced by the developing ovum which causes the symptoms. The term auto-intoxication might be a more apt description of this type of process

(3) *Carbohydrate deficiency* — The only support here is that the administration of glucose or sugar does, undoubtedly, in some cases bring about relief. Since, however, nausea and vomiting may begin when an expected period is one week late, it is difficult to believe that the glycogen content of the liver has already become exhausted. Nevertheless, intravenous administration of glucose rarely fails to relieve

(4) *Vitamin deficiency*—Every new discovery is heralded as the cause or cure of most diseases, to none can this be applied more strongly than to the vitamins. It is undoubtedly true that under certain conditions, in certain countries, or in a few individuals, lack of suitable vitamins, especially those of the B group, may come into the picture and should be used in treatment, but as a general hypothesis this suggestion cannot be supported.

(5) *Endocrine*—This is surely the most likely and the most attractive theory. When the vast and intimate changes occasioned in the endocrine system at the beginning of pregnancy are considered, it is astonishing that there is so little upset in the physical and mental conditions of the individual concerned. It is demonstrable that modifications take place in the functions and activities of certain of the ductless glands, particularly in the thyroid, pituitary and, more obviously, the ovaries, but it is likely that more changes than are known, and still less than can be demonstrated, may occur in these and other components of this mysterious system. With increasing knowledge it becomes more and more apparent that all the main and vital functions of the body are controlled directly or indirectly by the ductless glands. Here in pregnancy is a condition which is known to affect these glands, can only occur in the presence of their effective working, and is primarily dependent upon the particular one of these glands specific to the female. Surely, then, the endocrine theory is the most acceptable and the most commonsense of all.

This theory, however, does not help much in the elucidation of the problem, so far as etiology is concerned, and definite proof can only come with increasing investigation and knowledge. There is, moreover, one almost insuperable objection to all or any of the above theories. It may be presumed that the actual process of pregnancy, physical, mental, physiological, or biochemical, must be the same in every case. Why therefore is it possible for Mrs Jones to be completely free of sickness or indigestion, whereas Mrs Smith may be semi-prostrated for nine months? It is not sufficient to ascribe the condition as due to excess or lack of hydrochloric acid, to neurosis, toxæmia, and so on, unless it is possible to begin by saying why pregnancy should produce such causes in a woman hitherto untouched by these primary or secondary conditions. All investigations have so far proved inconclusive, whatever line of research is undertaken no single condition, no lack or excess, no abnormality or change in function is found to be present in a sufficient percentage of cases to justify, or even support, any one theory of etiology. Such uncertainty as to cause and actual biological conditions in the individual is necessarily reflected in the efforts at treatment. No definite line can be laid down and the method of trial and error is the only one available.

It is most likely that the upset in metabolism is due to the widespread changes which take place in the whole endocrine system from the moment of conception until some time after delivery. Other factors, such as change in intra-abdominal pressure, the individual nervous and psychological reactions, may be complementary but are not the fundamental causes of the complaint.

There are, too, certain associated conditions which have considerable influence upon the degree of severity of the symptoms. First among these is inefficient evacuation of the bowels, and by this is not meant just constipation nor the absence of the daily motion. It is common for a woman to say quite correctly

that the bowels move each day, and yet for the large intestine to become day by day more loaded. The average woman's idea of the most important duty of the doctor is a hurried visit, fitted in when least inconvenient and without regard to natural urgency, lasting perhaps for sixty seconds. Little imagination is required to assess the time spent over the actual business in hand, and the result is a gradual increasing hold-up upon much the same lines as the furring up of a hot-water pipe. It is not suggested that inefficient evacuation is the root cause but that it is an important factor in the maintenance of general health, which in itself must play some part in determining the occurrence or severity of any abnormal condition.

MORNING SICKNESS

Morning sickness is second only to indigestion as the most common of the many so-called discomforts of pregnancy. It affects all classes of pregnant women and is not, as often supposed, a perquisite of the well-to-do or leisured classes. If, however, leisure is spent cogitating over inner feelings the condition can undoubtedly become aggravated thereby, and considerable strength of mind is needed to force attention in other directions, with resulting benefit. The onset is common during the second month and the symptoms usually disappear by the end of the fourth month, though there is much variation both in time of onset and duration. The interesting observation, made quite spontaneously by many patients, has been that their sickness has disappeared with the recognition of foetal movement. I have not, however, been able to correlate these two happenings in a sufficient number to draw any conclusions.

A better terminology than "morning sickness" would be "vomiting of early pregnancy," since it by no means always occurs in the morning, but frequently at other times of the day, particularly the evening, in addition to, or instead of, the morning. It varies in degree from slight nausea to vomiting many times a day, without coming anywhere near a condition justifying the diagnosis of hyperemesis, its peculiarity being, that having eaten and vomited a hearty meal the patient can not only face, but desire, more food, which again may be vomited still without producing any distaste for further nourishment. Constant repetition for many weeks, with occasional intervals of improvement, is well tolerated and produces no signs of lack of nourishment, such as loss of weight or undue fatigue, which again is a most important distinction from hyperemesis, which invariably has a marked effect upon the general condition. Some patients feel extremely ill in an indescribable way—nausea but no desire to vomit, dizziness of a peculiar type, rather like the "swimming feeling in the head" after influenza, and many other vague but real and acute discomforts.

It has been suggested in the past that reflex irritation from other conditions was the basic cause, but this theory has long since been abandoned. It is nevertheless a fact that patients are met with in whom correction of uterine retroversion or removal of a grumbling appendix is followed by great relief, if not complete amelioration, of symptoms. Therefore a detailed general examination should always be carried out and attention paid to any abnormalities discovered thereby.

MANAGEMENT—This is a better word than treatment, since the condition requires definite managing as distinct from, although combined with, medicinal

Remedies A patient should be advised to lead a life as nearly normal as possible, without giving up any of her accustomed work or recreations, except those which are obviously unsuitable during pregnancy. Exercise in the fresh air is essential, without it no one can be fit, either physically or mentally; this applies particularly to the pregnant woman and no amount of indoor exercise, such as housework, can be an efficient substitute. It is best taken in the form of walking, preferably in two or more outings, as before lunch and before tea. Many can, and do, continue such things as tennis, golf, and even horse-riding, but, when asked for advice upon these activities, the only possible answer is that they can be tried experimentally at the patient's own risk, because in a great many cases they are unable to produce miscarriage. Bicycling seems to be comparatively harmless, though not a comfortable relaxation after the first few weeks.

Overfatigue is highly productive of digestive disturbances and should be avoided. If a woman gets up at her usual time in the morning, and otherwise carries out her regular routine, it is of great value to rest, lying down, for at least an hour after lunch, thus making a break in the hours during which she is on her feet. It is more effective and more natural than remaining in bed until half-way through the morning and then going all out until bedtime. A full night's sleep is necessary, too, and late hours, stuffy restaurants and all that they imply, should be given up.

Diet—Certain foods, or types of food, are well known to precipitate sickness and indigestion in the pregnant woman. These are fried or fatty foods, pastries, highly spiced sauces or condiments, and excess of bulk-producing vegetables like cabbage, these, and anything the individual notices to increase her symptoms, should be excluded and the sugar intake amplified by the free use of glucose. Otherwise, a diet to which she has been accustomed is the best, but care should be taken that it includes a sufficiency of fresh and uncooked items, especially milk, of which latter one pint per day is a good minimum if tolerated. Small meals taken frequently should be the rule, rather than large amounts at long intervals, it is almost universal that sickness comes on as the stomach becomes empty, and is at once relieved by food. Those who complain of literal morning sickness, that is, those who are nauseated and tend to vomit immediately upon getting out of bed, should be advised to have something, such as a few biscuits and a cup of weak tea, before moving at all and, to be effective, this must be taken immediately they wake and even before they sit up.

The use of alcohol need not be completely banned, many have no desire for this, nor for smoking, and an actual distaste is often an early symptom noticed by the patient herself. In those in whom this does not occur, however, the strictly moderate use of either seems to do no harm, and if they form one of the comforting indulgences of life there is no point in depriving the patient of their easement, thus increasing what is often described as the boredom of nine months' discomfort.

It is necessary to have a standard scheme to put into operation when consulted regarding this problem. The following is suggested—

- (1) A complete and detailed examination to exclude any complications or concurrent conditions

- (2) Correct any abnormalities which may be present, such as retroversion and constipation
- (3) Advise regarding diet, times of feeding, exercise, and general mode of life, with special reference to glucose
- (4) Give some alkali as the first step in the trial and error method of covering the individual patient's requirements. A prescription, which is often found successful, is —

B Sodium bicarbonate	2 ounces
Light magnesium carbonate	1 ounce.
Oil of peppermint	30 minims
Made up in the form of a powder one level teaspoonful to be taken in water when required	

The patient should be told to sip this whenever the nausea arises. Other useful alkaline preparations are alka-zane, Enos, or any similar effervescing saline. A simple alkaline mixture made up on these lines with the addition of dilute hydrocyanic acid, 3 minims, is worth trying.

- (5) If this produces no relief, injections of œstrin should be given, and it is found that the natural rather than the synthetic preparations are the more effective. Progynon in 5 mgm doses once or, if necessary, twice a week, is perhaps the most suitable, and there need be no fear whatsoever of its producing a miscarriage. This will relieve in perhaps one-third of the ordinary cases, and for those in whom it fails extract of the suprarenal cortex can be tried. This is best given in small doses, 1 c cm, of preparations such as eucortone, which again will be found of help in roughly one-third of the remaining cases. There remain then the 30 to 40 per cent of patients who still fail to find any improvement. These are likely to be either of the neurotic type or those in whom the condition is quite severe but who are still able to carry out their daily life. If, however, they are only doing so with the greatest difficulty, the next step is to give intravenous glucose, 5 per cent. saline, 10 c cm once a week, or more often if necessary. This will produce improvement in almost all to whom it is given, but for the few resistant cases it can be combined with 5 to 10 units of insulin.

If, after working through this programme, which by the way is not often necessary, any patient remains unrelieved, a decision has to be taken as to whether it is a case of complete neurosis or an incipient hyperemesis, and in either event the only procedure to advise is bed under complete nursing conditions, restriction of diet, visitors and so on, on the lines of the Weir Mitchell treatment, under which all will be cured except those needing termination of pregnancy or a sympathetic but firm lecture upon the importance of their making another attempt to carry on for a few more weeks, by which time nature will have eased their suffering. It is, however, uncommon to be forced to go right through this programme in any one patient, since either the simple remedies have effect or a condition is quickly reached for which the more drastic measures referred to are instituted. In dealing with these patients it is desirable to try to strike a happy medium, not regarding their complaints too much in the light of what every woman must expect an

therefore that no attempt should be made to give relief, at the same time avoiding too grave and heavy attitude, which will produce equally bad results. A sympathetic understanding of this particular problem lays the foundations for that mutual confidence which can by itself ease many of the fears and trials so often associated with pregnancy.

INDIGESTION

Indigestion is by far the most common of the so-called minor ailments or discomforts of pregnancy. It is extremely rare to look after a patient throughout his period without being asked to give advice regarding some form or other of dyspeptic symptoms, and yet this condition is almost completely ignored in all textbooks upon obstetric or antenatal care. One reason for this omission must surely be the lack of knowledge concerning the etiology of the condition, and this in turn is perhaps largely due to familiarity producing contempt.

Minor though this complication may be, it is yet an important factor in a woman's feelings when deciding for or against repeated pregnancies, and is certainly a common item in producing that "never again" attitude which is responsible perhaps in part for the present situation as regards the birth rate in this country. It is possible to guarantee that a patient will look back upon her labour with complete equanimity, but how impossible to give the same assurance concerning even this one discomfort of pregnancy. Figures and statistics are boring and fallacious, but it may be stated that no fewer than 75 per cent of cases recently reviewed complained of severe indigestion.

SYMPTOMS—These are of such variety that they can be extended almost *ad nauseam* in regard to detail, but in the main they comprise the following complaints, each of which will be dealt with more specifically later on: heartburn, nausea, palpitation, retrosternal pain, epigastric pain, flatulence in various forms such as distension, "full up after a small meal," "a feeling as if I had swallowed a tennis ball which has stuck." Any or all of these symptoms may occur in the individual patient, some in combination, others separately, varying in severity, duration or time of occurrence. The time of onset varies greatly, it is common for morning sickness to disappear during the fourth calendar month, to be followed by an interval of exceptional well-being. The lucky ones maintain this condition for the remainder of the pregnancy, but the majority gradually slide into a state of chronic indigestion, well established by the end of the sixth month. From then on, while general health remains good, life is apt to be clouded by ever recurring and often increasing symptoms of maldigestion, which persists, only to disappear almost miraculously at the conclusion of the third stage of labour. It is quite extraordinary how a patient after months of discomfort can satisfy, within a few minutes of delivery, her craving for a cup of tea without paying the penalty to which she has become so accustomed.

What investigation is necessary when the practitioner is asked for advice for indigestion during pregnancy? As a rule, no intricate laboratory tests or X-ray examinations are called for, and a careful general overhaul permits the conclusion that the symptoms are due to the pregnancy. But, as in all medical problems, it is necessary to be careful not to take too much for granted. The general overhaul

must be complete and detailed and certain symptoms demand special investigation. If complaint is made of retrosternal or epigastric pain, palpitation or breathlessness, beware. The lighthearted dismissal of such symptoms will sooner or later end in tragedy for a patient and shame for the practitioner. Oesophageal, gastric, or cardiac conditions can, and do, arise during pregnancy, so, too, can appendicitis or ureteric calculus, pneumonia or gall-stones. It is dangerously easy at that most important stage of onset to dream momentarily of wind and constipation, of sodium bicarbonate and cascara, only to endure the more prolonged nightmare of the missed appendix and the accusing looks from the relations of the deceased!

TREATMENT—Before starting active treatment it is necessary first to go into such matters as diet, exercise and mode of living. In these respects what has been said with regard to morning sickness applies also to indigestion, and the same rules should be followed. Reference must, however, once more be made to the effects of constipation. The old gag about what a woman does once a day, once a week and once a month contains more than a modicum of truth, and it is useless to attempt the treatment of indigestion in the presence of an irregularly or incompletely acting bowel. Mild aperients taken regularly are better than stronger remedies when required, since by then the harm of resorption is done, or alternatively the "when required" is interpreted as "Saturday night," and not then unless it is quite convenient. Vegetable laxatives, such as senna pods, should be preferred to the various preparations of liquid paraffin, which in themselves are not exactly carminatives, mild effervescent salines or milk of magnesia are often sufficient. Individual tastes and requirements vary so greatly that quite often the suitable aperient can be discovered only by the method of trial and error, and no one preparation can be given pride of place. Whatever will produce a single, easy, non-fluid and comfortable motion each day is the right aperient for that particular patient.

THE INDIVIDUAL SYMPTOMS

(1) *Heartburn*—This is the most disabling and, in those seriously affected, the most persistent of all discomforts which together have been classed as forming the syndrome of pregnancy maldigestion. It is not, however, in its severe form, a common complaint, not more than 20 per cent of patients suffer from it, except to a minor and intermittent degree. The time of onset varies, but is generally after the first four months, and it has a curious tendency to improve during the last four weeks, this in spite of such theories of causation as are concerned with increasing pressure on the stomach. It is, too, a symptom which may have its own particular and private etiology, so that it is necessary to digress for a moment to consider its possible causes. Owing to its nature different alkaline media have been used for relief or cure, hyperacidity has for long been thought to be the basis of causation. It is a curious fact, yet nevertheless a fact, that the hydrochloric acid content of the stomach is reduced below normal level during pregnancy. This has been tested by different workers by means of samples taken after the passage of a stomach tube, the results have been no more convincing than that nearly all show a reduced HCl content which, in addition, varies considerably during the different weeks of pregnancy, or different hours of the day. Moreover,

the degree of acidity appears to have no bearing upon the absence or presence of heartburn, patients with marked decrease in the HCl content of the stomach are equally immune from, or liable to, heartburn as those with a normal or excessive acidity. American workers have investigated by X-ray examination the motility and changes in position of the stomach and gastro-oesophageal junction. Their results show the same inconsistency, both in actual findings and in the relation between findings and symptoms, as in all other investigations.

It would appear, however, that as a rule gastric motility is reduced during pregnancy; that the normal rhythm of gastric and oesophageal peristalsis becomes regular, with a consequent delayed emptying of the stomach, increasing as that organ becomes more horizontal, and that any stimulation of the gastro-oesophageal junction will produce heartburn by inducing reversed peristalsis. Herniation of the gastro-oesophageal junction has been demonstrated with a return to normal a few weeks after delivery. All this would tend to show that an upset in the neuromuscular mechanism may be at least one factor in producing this symptom.

In spite of the foregoing it is necessary to start with kindergarten methods to discover to which treatment each individual will best react. Alkaline powders or mixtures come first and the strength or dosage should be on the heroic scale. One or two tablespoonfuls of the proprietary stomach powders, sal volatile, one teaspoonful in one ounce of water, and so on, must be tried before casting them aside as useless. A few patients find that sucking soda mint or Jenner's lozenges provide reasonable comfort. Dilute hydrochloric acid, 10 minims, taken during or after meals will relieve a few and, here as in other conditions, such relief is immediate and described by patients as "almost miraculous." The hydrochloric acid can be taken in liquid form mixed with syrup and water, or more conveniently in tablets of betaine.

When these simple remedies fail the practitioner is sometimes faced with a patient whose only time of comfort is actually during a meal, and who then suffers an acute exacerbation lasting perhaps an hour before settling down to her normal state of great discomfort. These unfortunates, though rare, are reduced to the utmost misery and should be treated by injections of prostigmine, 0.0005 gm., given intramuscularly. This can be repeated as required without fear of inducing uterine contractions, to those whom it helps it is rarely found necessary to give more than one injection a week and it seems to have an increasingly lasting effect. This lends support to the theory of reduced motility and reversed peristalsis.

Vitamin B with thiamine, nicotinic acid and other combinations have been used with a resulting increase in the HCl of the stomach, but the effects upon heartburn are not sufficiently convincing to warrant any conclusions.

(2) *Nausea and vomiting*—Nausea and vomiting during the latter half of pregnancy are not very common complaints and should always be regarded with suspicion. These symptoms are more apt to occur in those who may be classed as "livery" subjects, who cannot in normal times digest more than a limited amount of fatty or rich foods and are liable to "sick headaches." Such patients are often cured by the occasional administration of three small doses of calomel, 1/6 grain after meals, followed by Epsom salts, one-and-a-half teaspoonfuls in one ounce of water first thing the following morning; they should then lie on the right side

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INDIGESTION IN OLDER CHILDREN

By C. PAGET LAPAGE, M.D., F.R.C.P.

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INDIGESTION means failure to digest food effectively and with comfort. It is usually taken to refer to disorders of the upper digestive tract and the liver.

Acute gastric indigestion causing pain, vomiting and collapse arises from the ingestion of unsuitable foods or from undue exercise with exposure and mental stress. *Acute gastritis* has a more organic basis and may be due to infections or corrosives. Much mucus is present and the inflammation generally extends to the upper intestinal tract.

Chronic indigestion is shown by symptoms like furred tongue, offensive breath, constipation, headache, irritability, yawning, drowsiness, rough areas in the skin, vagaries of appetite, nausea and gastric discomfort, eructations, waterbrash, stomach cough and vomiting of mucus, gastric distension and peristalsis and epigastric tenderness. It may also cause reflex disorders of behaviour with irritability, tic, disturbed sleep and speech and nervous habits.

ETIOLOGY

A consideration of cases shows that indigestion follows repeated acute attacks or chronic digestive disease in infancy, continued imbalance of diet with excess of any one indigestible constituent, continuous fatigue due to lack of sleep, physical and mental stress, and the cumulative effects of a chronic septic focus or disease. Dispositional tendencies and mechanical factors have also to be taken into account. The causes of indigestion to be considered can be arranged under the headings—

- (1) Metabolic and biochemical, i.e., underfeeding, overfeeding, constipation, liverish, bilious, hepatic disorders and mental and physical stress with excessive waste products, dispositional and exudative, and occasionally parasitic infections.
- (2) Infective, from a focus like infected tonsils, adenoids, teeth, glands, bronchial or mesenteric, appendix and pyelitis.
- (3) Mechanical, by kinks and bands, pyloric spasm and perhaps foreign bodies.

Metabolic influences—Slow starvation or continued deficiency in vitamins may cause debility and anorexia, especially if there is mental stress. In such cases, because digestive tolerance has not yet been upset, sleep and mental rest soon restore function. But an unbalanced diet will, if continued long enough, so overload metabolism, that persistent and intractable indigestion and intolerance supervene. Symptoms may, however, not appear for some time because most children have a high initial degree of digestive power. Still even this high degree of tolerance is nowadays often overwhelmed by the fashion for the fatteners and for the high vitamin content foods rather than for the body-building proteins and the fuel-forming carbohydrates. Constipation too may cause toxic absorption, either from stasis or through the disturbing effects of unwise purgation.

Dispositional peculiarities in exudative children may mean that dislikes of food like fish, cod-liver oil, milk, orange juice, and vitamin D preparations may be not fads or fancies but genuine aversions, because they are founded on actual reactions like sickness, flatulence and urticaria. Furthermore, exudatives who overfed, in spite of the fact that they are katabolic and rapidly use up the food they absorb, tend to develop indigestion and catarrh. Being intense they also add to their metabolic overload by reacting strongly to mental and physical strain and thereby loading the blood with waste products. They are often "bad at breakfast" and may take only a small meal then but will enjoy the later meals when the metabolic activities have awakened.

Nervous—The "Monday morning headache" of the child who is timid about school is a well-known symptom.

One girl patient of mine used to vomit every morning just before starting for school until it was found that she had an anxiety neurosis about her journey. She had to change buses half way with only a few seconds to spare. Once the dread of missing the second bus was removed she was all right.

In another case a boy of ten was sent to me because he had colicky pains near the umbilicus and brought up much wind after each meal. There was no vomiting or nausea but he was much distressed and the condition really suggested some form of obstruction. However, the parents, after being told to watch for awkward swallowing, found that this was taking place and by telling him to eat more carefully were able to relieve most of his symptoms. This boy was subject to tic and an inquiry showed that he was in great fear of one teacher.

Phobias and fancies may arise from parental example or from resistance to suggestions and forcing of food early in childhood.

Real hysterical anorexia is comparatively rare, but girls, and occasionally boys, may fall into a hypochondriacal state and develop a form of negativism and food refusal. They seldom go so far as the passionate food refusal of the young child but they may reach a state when nervous reactions and a negativistic mental attitude make them so capricious and exacting that they may even starve themselves in self-pity. Jealousy of the attention given to another child may also play its part. If, as is often the case, a septic focus adds toxic effects the indigestion is the more difficult to cure.

Infective conditions—Local inflammation of the gastro-intestinal tract may cause temporary abnormalities of juices, glands and lining membranes. The gastro-hepatic duodenal area may be subject to recurrent catarrhal attacks, a biliary attack with loss of appetite and perhaps vomiting. These attacks are often connected with recurrent tonsillitis. The child has pain in the duodenal area and a chronic form of dyspepsia. Often the recurring attacks cause liverish symptoms with pale stools but actual jaundice is uncommon. A "grumbling" appendix often causes indigestion.

Septic foci in general act by their prolonged toxic action on general health and metabolism and may also cause postural faults which may affect digestion by lack of tone. Septic tonsils and adenoids, ears, teeth, glands and chronic pyelitis are examples, and if they occur in conjunction with metabolic disorder the two forms combine to form a vicious circle which may be difficult to break.

Intestinal parasites probably have mild toxic biochemical effects which may pass unnoticed because attention is directed to the colicky pains and external signs.

Mechanical causes of indigestion are not so important in childhood as in adults.

life Real ptosis is rare but some degree of stomach dilatation is not " Splashings may or may not be important

One boy, seen recently, by working his abdominal muscles vigorously showed me his with great glee, and in his case their presence did not seem to indicate anything serious In another case, there was some degree of pyloric spasm which had followed repeated attacks of gastro-duodenitis

Actual persistence of pyloric stenosis into later life is probably rare My colleague Mr H H Rayner, tells me that though he has, during many years experience, been at pains to find such cases in adults he has seen only one case which suggested a persistence of pyloric stenosis

Bands and adhesions may follow previous abdominal tuberculosis and occasionally there is a congenital kink high up Hirschsprung's disease and faecal collections with loose stools passing through a channel are unusual lower-bowel conditions all of which may cause signs of indigestion.

DIAGNOSIS

Personal history—A careful history is a most important help to diagnosis and while it is being taken the child should usually be out of the room until wanted for questioning

An inquiry about the diet will show deficiencies, irregularities, imbalance and overfeeding Furred tongue and offensive breath, urticaria (heat lumps), patches of skin roughness, urates or acidosis, point to a metabolic overload

Waterbrash and sour regurgitation point to pyloric spasm Discomfort and fullness in the upper abdomen point to upper bowel dyspepsia and colic to lower Pale stools indicate defective secretion of bile Recurrent looseness of the bowels with or without mucus may indicate persistent inflammation of the bowel lining and perhaps an inflamed mesenteric gland which, although it is a "closed" tuberculous focus, still gives abdominal pain Lienteric diarrhoea is usually associated with nervous excitability and perhaps a palpable spastic colon and sudden bowel emptyings with mucus Pica indicates gastric irritability, and unnatural hunger, queer behaviour with nervous irritability and irregularity of symptoms and a capricious finicky appetite point to a psychological cause with inferiority complex

The family history may show nervous tendencies in the parents and an anxiety neurosis of the mother which may lead her to force certain foods and to press her own likes and dislikes on the child with bad results, or again, it may disclose parental tendencies to metabolic illnesses, like milk intolerance in infancy, acidosis in childhood, bilious attacks, migraine, eczema and a gouty tendency, which may indicate that the child is of the exudative type

PHYSICAL EXAMINATION OF THE CHILD—The child can now be brought into the room, put at ease, questioned judiciously about symptoms and watched while the mother is taking the clothes off Facial pallor, sallowness, "liversh" rough patches are noted Lines between the eyes or round the mouth and nose, nail biting, tic, and self-conscious, "silly" behaviour show a psychological origin

Pallor does not always mean anæmia Exudatives are pale, though their blood count is normal The dark rings under their eyes lead to unfounded maternal fears of anæmia or kidney disease The symptoms are, however, of metabolic origin, and if a cloud of albumin is present it is only orthostatic

prolonged period of rest is needed. Exercise tends to promote blood circulation and so encourage toxæmia, a fact which is not properly appreciated by parents and others who have to deal with this type of case.

Change of air, residence in a milder, drier climate, the use of ultra-violet rays and the effects of massage as a restful and a general restorative must be remembered. Later, when circulation through any septic focus is closed, steady spells of exercise or of drill, dancing or rhythm exercises are of great use in promoting metabolism and healthy tiredness. A spell of rhythmic exercise is a good soothing agent psychologically. It rests and refreshes the autonomic nervous system.

DISPOSITIONAL ELEMENTS

In my experience exudatives form a class in themselves. Unless they are properly managed as regards exercise, emotions and eating, they will, once they have started the metabolic habit, continue to pass through sequence after sequence of gradual accumulation of metabolic overload, followed by some exudative discharge, such as acidosis, urticaria, eczema or colitis, and then a period of freedom. Repetition of a habit brings with it ease of excitation, and if the metabolic habit is complicated by the effects of a septic focus, a vicious circle is formed which is difficult to break. Exudatives show in this way urates, migraine, acidosis, eczema, colitis and, in later life, gouty tendencies. If overloaded with milk fats they tend to catarrh and there may be some truth in the old saying that "milk makes phlegm." Diet should therefore be restricted in rich fatty foods like creamy milk, butter, milk chocolate, cocoa made with milk and rich bone stock. Rich combined fatty tonic foods are not suitable nor is cod-liver oil or excess of the citrus fruits. Exudatives can have plenty of food but it should be plain and should have in it a large proportion of proteins. Thick bread and thin butter should be the rule. Sugar and starches are allowed and so are all flesh foods, fish, fowl, meats and rabbit together with vegetables and puddings. Meat fats are usually well digested and fried foods are allowed. Often a little vinegar or pickle will help the child with a mild hypochlorhydria. For instance chips and vinegar are often a treat. Cheese, bacon, and marmite are allowed. Plenty of fluid, water, weak tea, but not too much milk. A "mineral" is better than orangeade or lemonade.

Medicinally, alkalis like magnesia and sodium bicarbonate are useful. Exudatives are often well suited by a dilute hydrochloric acid mixture with or without pepsin because they often have a mild hypochlorhydria. Many do well with the help of a mild rhubarb and soda mixture given in a dose which does not gripe or purge but acts as a mild persistent alkaline aid to metabolism. This may have to be taken for months or years and can be regarded as a table medicine and not as a drug.

PROGNOSIS

The prognosis in indigestion is good if a correct diagnosis is made and the patient is treated on the above lines. But it is most important to insist on detail in history taking and examination and to carry on treatment for a sufficient period of time. And for correct diagnosis the importance of a careful and detailed history must once again be emphasized.

INDIGESTION IN INFANCY

By F. M. B. ALLEN, M.D., F.R.C.P.

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DIFFICULTY in digesting breast milk or a modification of cow's milk is often imaginary than real. It must be remembered that vomiting is frequently attributable to factors other than indigestion, pain may be caused by colic and crying may be due to hunger, whilst unnatural motions are more often the result of irregular alimentary motility than of "indigestible" intestinal contents.

PROTEIN INDIGESTION

Protein is present in milk mainly as casein and soluble whey proteins, such as albumin and lactoglobulin. It is only the former which gives rise to difficulty in digestion, and in cow's milk this is especially so as it contains 3 per cent. casein compared with 0.7 per cent. in breast milk. Some infants vomit cow's milk and suffer from colic due to the passage of masses of protein curd along the small intestine. The explanation is that human milk is suitably buffered to facilitate digestion in the infant's stomach, whereas cow's milk has a higher buffer value, so that a heavier demand is made upon the available free hydrochloric acid to neutralize the alkaline salts and to attain the optimum pH for peptic digestion. Normally this difficulty in artificial feeding is overcome by the free hydrochloric acid of the gastric juice, but in a few cases special measures have to be adopted if the infant's resources are not adequate, curd is vomited, and colic, with the passage of casein masses in the motions, occurs. This is associated with crying and loss in weight, and if the situation is not fully appreciated the strength of the milk mixture is weakened, resulting in further crying (from hunger) and increased weight loss.

It is possible that babies with typical curd indigestion are congenital achlorhydrics. The milk may be diluted with cereal gruel (barley water, rice water) and citrate may be added, or it may be acidified with an organic acid (lactic acid or lemon juice) to modify the curd and render it more easily digestible. Addition of lactic acid is the most rational of these measures as it achieves the desirable pH with facility. The acid should be added to sterilized or pasteurized milk, drop by drop, until a fine curd occurs, about fifty drops being required to acidify one pint. If a baby vomits lactic-acid milk, either it is not properly prepared or the condition is not one of protein indigestion. Lactic-acid milk has other uses too, as it is appropriate when concentrated feeding (e.g. after illness) is desirable, or in the presence of diarrhoea. Lacidac (Cow & Gate, Ltd.) is a dried lactic-acid milk preparation one measure of which added to one ounce of water reconstitutes one ounce of lactic-acid milk.

FAT INTOLERANCE

As with protein so with fat. Perhaps more infants find difficulty in dealing with the fat in cow's milk than with the protein. It is true that the amount of fat in

PYLOROSPASM

This may arise in infants of nervous temperament and also in some in whom is gastric irritation of a nature which provokes spasm of the pylorus. The condition resembles pyloric obstruction in the projectile character of the vomit and, depending on the amount of food lost, constipation and failure to gain (or even loss of weight). The pylorus is never palpable nor is gastric peristalsis visible and a response follows appropriate treatment. The mother should be reassured; a dose of a mixture containing tincture of belladonna 3 minims, bismuth carb 4 grains, sodium bicarbonate 3 grains, peppermint water to 60 minims given to the baby before feeds, or eumydrin or pylostropin may be used. The response to one of these is more rapid than in pyloric stenosis and serves to establish diagnosis without radiography.

RUMINATION

This condition is not so rare as to deserve omission from this consideration of indigestion. There is little doubt that the habit of regurgitation of food is a new and comparable with thumb-sucking, bed-wetting and other less desirable habits. The elucidation may be puzzling unless the baby is observed in the act of "vomiting." It will be seen to make movements of its mouth and throat, or be observed putting its fingers into its mouth to cause food to regurgitate from the stomach. The infant is obviously proud of its feat and derives considerable pleasure from the experience.

The treatment includes thick cereal feeding or splinting of the arms to prevent flexion of the elbows, thereby making it impossible for the infant to irritate the pharynx with its fingers.

CONDITIONS OF THE ŒSOPHAGUS

Œsophagitis and Œsophageal obstruction can masquerade as dyspepsia and other conditions which, while admittedly unusual, can cause difficulty in diagnosis. Œsophagitis is almost always due to thrush infection and is associated with stomatitis. It has been known to follow only mild mouth infection with *monilia*. The condition is often fatal, but treatment should be attempted with a drug such as a suspension of acriflavine in equal parts of water and glycerol (1 in 1000) applied fairly generously to the mouth and pharynx. An aqueous solution of gentian violet (2 per cent) applied to the tongue and buccal mucous membrane as a paint is an effective means of treating thrush stomatitis.

Œsophageal obstruction may be due to spasm or atresia. The origin of the former is not understood, the latter is a developmental defect similar to that of the duodenum, colon and elsewhere in the alimentary tract. Sometimes the vomit is large and forceful, suggestive of pyloric stenosis, but it does not occur so often. It may be mistaken for mismanagement of nursing technique, but regulation and observance of this does not relieve the vomiting. It is advisable to make an X-ray examination of an opaque meal passing down the Œsophagus when the condition of spasm or atresia will be revealed. If the infant survives some weeks there is at least a narrow channel, the opening of which can be dilated with an Œsophagoscope and dilated, first at weekly and then at longer intervals. Complete occlusion of the Œsophagus is incompatible with life unless a gastrostomy is performed.

THE EARLY DIAGNOSIS OF CARCINOMA OF THE STOMACH

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CARCINOMA of the stomach is one of the nightmares which besets a physician as it is so easy to overlook the correct diagnosis in its earlier stages, the symptoms may be misleading, or may be entirely absent until the disease has reached a stage at which it is past remedial operation. So often are patients seen in whom the disease has already reached the stage of a large fixed tumour in the upper abdomen, or with obvious secondary deposits in the liver or peritoneum, even at the first consultation. The frequency of the disease is shown by the 12,690 deaths in England and Wales in 1942, and of 38,000 persons annually in the United States of America (Easterman and Balfour, 1936).

When taking a clinical history, the age of the patient is of prime importance. A history of indigestion in a young person suggests a simple dyspepsia, perhaps a peptic ulcer, but when the patient is past forty years of age, the possibility of a growth looms much larger. At least 95 per cent. of patients are over forty years of age (Easterman and Balfour, 1936), and in thirty consecutive cases studied at the Charing Cross Hospital twenty-eight were over forty years of age, and the remaining two patients were both thirty-nine years old. In other words cancer of the stomach is rare before the age of forty. Men are often said to be more prone to the disease than women, even in the proportion of 3 : 1 in America, but in this country the sex incidence in men preponderates only to the extent of 4 : 3.

EARLY SYMPTOMS

The earlier symptoms fall, in the main, into four groups—

(1) *Simple dyspeptic symptoms* are perhaps the most misleading, but when a series of case histories is re-examined, an early history of epigastric discomfort with flatulence and a sense of fullness while eating, or shortly afterwards, which may or may not be associated with pain, is frequently observed. "Belching" may follow in an abortive attempt to relieve the fullness.

H. K., aged sixty-six, for two months had discomfort in the epigastrium with flatulence, later vomiting, a poor appetite and loss of weight were complained of, and investigation revealed a carcinoma on the lesser curvature of the pyloric antrum.

The feeling of fullness after a small meal is probably due to the carcinoma producing a rigid stomach wall, which can no longer expand to receive food. When a patient is only able to take a small volume of food or drink at a time, this is a sure indication of widespread involvement of the stomach wall. The associated sense of flatulence is often aggravated by fermentation due to the absence of HCl.

Loss of appetite is more commonly known to be a suggestive sign but it is not

(4) *OTHER SYMPTOMS* which may occur are —

(a) *Anæmia* A growth in the body of the stomach may attain a large s



FIG 1B Large cancer in middle of the body of the stomach

without local symptoms or signs, until the patient seeks advice on account of the anæmia

C G, aged fifty-four, had for a year become progressively short of breath and pale. For three months she had completely lost her appetite, and more recently still complained of epigastric flatulence and vomiting. She had lost 2½ stone and her hæmoglobin was 51 per cent. Occult blood + + + X-ray showed a carcinoma of the pyloric antrum

The anæmia is usually hypochromic in type, but is rarely hyperchromic

(b) *Hæmatemesis and melæna* rarely arise from a neoplasm of the stomach (under 5 per cent of cases) and when hæmatemesis does occur, this is a strong

argument for believing the cause is *not* of malignant origin. On the other hand, slow bleeding is common, and a "coffee-ground vomit" is highly suspect. It appears as if malignant disease in the stomach tends to limit its own blood supply, making large hæmorrhage improbable.

(c) *Sudden perforation* is likewise rare, but every surgeon with experience of gastric disease will be able to recount cases of this type. The infiltrative properties of a growth cause it soon to become adherent to other structures and so to protect itself from the consequences of perforation into the peritoneal cavity.

(d) *Loss of weight and asthenia* are two characteristic symptoms. Although loss of weight is common to many dyspeptic syndromes, when met in association with a complaint of tiredness and progressive lack of energy, the condition in later stages often heralds malignant disease in the stomach, which should be sought for. Medical treatment may cause temporary abatement of the symptoms, and even allow a gain of a stone or more in weight for a time, but the improvement can only be temporary. It is interesting to note how frequently the many forms of gastritis, carcinoma of the stomach and other gastric disorders are associated with a complaint of lethargy, as if there were some essential link between the two conditions.

(e) The symptoms of secondary deposits, particularly *ascites*, may be met early, but usually are late in making their appearance.

(f) Other primary or early symptoms more rarely found are *persistent diarrhœa* (particularly with a "leather-bottle" stomach), *phlebitis* and *polyneuritis*.

INVESTIGATIONS

When a suspicion of cancer of the stomach arises, a full investigation of the case is an absolute necessity.

CLINICAL EXAMINATION may reveal nothing, especially if the diseased area of the stomach is overlain by the left costal margin. But in some an area of tenderness in the mid-epigastrium, or in the left hypochondrium, or perhaps a definite tumour will be found. Sometimes the size of the tumour will be out of all proportion to the symptoms, and it will be wondered how such a large tumour could possibly develop without giving itself away earlier. These "silent tumours,"

are common in the more capacious body of the stomach than at either end, and yet be operable so long as they are still mobile and not too adherent to other

Unlike a simple ulcer, malignant disease seems rarely to produce rigidity or "guarding" of the overlying muscles, and when rigidity is prominent malignancy is less likely to be present.

A clinical examination is never complete without examination of the areas in which secondary deposits may be found. Thus the left supraclavicular fossa, the liver, the peri-umbilical region and especially the pelvi-rectal pouch must always be examined. How often has a rectal examination by a physician or surgeon blessed with a long right index finger revealed the tell-tale hard masses in the peritoneum in front of the upper part of the rectum (the "rectal shelf"), or even an ovarian tumour as described by Krukenberg.

themselves Typical radiographic findings are shown in fig 1A, 1B, 1C

A *fractional test meal* can be almost as informative, but there is a good deal of misconception as to the results in cancer of the stomach Broadly speaking there are two distinctive findings, as shown in fig 2A, 2B, and 2C

The first type of curve is the most classical There is often complete absence free HCl, but a high "total acid" curve, quite distinct from that of pernicious anæmia (fig 2C) The difference lies in the fact that the free acid titrated HCl only, whereas the total acidity represents also the titration of the weak organic lactic and butyric acids produced by fermentation and decomposition the stomach

The second type of curve illustrated by curve 2B shows that free HCl may be present in normal or even excessive amounts, and with correspondingly little difference between the free HCl and "total acid" curves, for in this case fermentation is inhibited by the free HCl present It cannot be too widely known that a test-meal curve such as this now under discussion can be present side by side with cancer of the stomach Hurst believes that curve 2A is due to "gastric cancer" and curve 2B to "ulcer-cancer," indicating two separate predisposing causes of gastric cancer When small amounts of altered blood are present throughout, with either type of curve, diagnosis is correspondingly simplified.

Occult blood tests in the stools are most valuable It is characteristic of most carcinomas of the alimentary tract that they bleed in slow but continuous fashion and this in itself will enable altered or "occult" blood to be identified in the stool often in considerable amounts If after suitable preparation three specimens of stool are examined on successive days and none contains any occult blood, carcinoma is extremely improbable, and in all cases met with over a period of years in only one was this test consistently negative, and yet a carcinoma of the stomach present

Gastroscopy is the latest method of examination added to the armamentarium of the clinician Its use is more fully described by Dr Morton Gill in this same issue, and in skilled hands it is most useful There are certain areas of the stomach difficult to visualize, as around the cardia and sometimes in the pre-pyloric region of the lesser curvature, but when seen, the gastric carcinoma can be typical at quite an early stage The characteristic features are the undermined and rolled edge of the ulcer, the nodular appearance of its margins and the frequent oozing seen even during the examination Also it may be noticed that the peristaltic waves halt over the area of the stomach wall, infiltrated and made rigid by growth

Diagnostic medical treatment—Every effort should be made to establish a diagnosis as early as possible by the above methods, for on this the success of surgical treatment depends There are occasions, however, when it is not desirable to submit an elderly patient to an exploratory laparotomy, especially when the gastric ulcer may be simple and not malignant In such cases, the effect of a short course of medical treatment may be invaluable confirmatory evidence With a simple peptic ulcer, the rapid relief of symptoms is usually striking when the patient is put to bed on two-hourly feeds, with alkali As a rule within a few days pain disappears later local and midline epigastric tenderness are no longer found and after two to three weeks the stools become free of occult blood When the

sequence no longer holds, but pain and bleeding persist in spite of treatment, and especially when the X-ray deformity persists unchanged, then cancer must be strongly suspected. It is important not to be misled by the relief of pain and tenderness which occurs even in carcinomatous cases, discussed on page 231 in this article. In these the X-ray appearances may indicate some healing, with a diminution in size of the ulcer, but never a complete disappearance of the lesion. The importance of regular X-ray examination of a suspect deformity in the presence of symptomatic relief is obvious, and if the ulcer is in one of the regions of the stomach where malignancy is likely, nothing less than complete radiographic healing should be accepted as a sign that the condition has cleared.

CONCLUSIONS

Early diagnosis of cancer of the stomach is in the hands of the physician who recognizes the earlier symptoms. Unfortunately many patients do not seek advice until the growth is well advanced.

Certain broad principles should be borne in mind —

- (1) Cancer of the stomach is rarely met before forty years of age.
- (2) It may follow a long history of previous dyspepsia or may initiate digestive disturbances.
- (3) The prominent symptoms in its early diagnosis are flatulence and a sense of fullness after meals, often an ulcer syndrome with pain at regular intervals after meals, and a little later loss of appetite and loss of weight.
- (4) Anæmia is present in a moderate degree at an early stage.
- (5) Occult blood tests of the stools are inexpensive and give an important indication of alimentary bleeding: three successive negative findings will usually exclude carcinoma, but consistently positive results call for further investigation.
- (6) Fractional test meals give, in the main, curves of two types: the one shows little or no free HCl but a high total acidity, the other gives a curve indistinguishable from normal.
- (7) An early diagnosis is favoured by the occurrence of obstruction either at the cardia or the pylorus, but when occurring in the middle of the body of the stomach the growth may reach large dimensions before the patient seeks advice.
- (8) Other special investigations which aid diagnosis are one or a series of X-ray examinations and also gastroscopy.
- (9) Finally, the response to adequate medical treatment may aid, for when this latter fails, cancer is more than probable.

Thanks are due to members of the staff of the Charing Cross Hospital for permission to make use of the notes and X-ray pictures of patients under their care.

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more than a hæmatogenous gastritis which may or may not be due to the influenza virus

(b) As already mentioned, suppurative gastritis is exceedingly rare and, as it nearly always gives rise to a general peritonitis, it will usually require surgical treatment. Even so it is generally fatal

MORBID ANATOMY—Briefly the changes found in acute gastritis are the same as in any other acute inflammation with the addition of erosions of the mucosa, which are usually superficial and rarely penetrate into the submucous layers. The mucous layers are infiltrated with inflammatory cells and the vessels engorged. The gastroscopic appearances in acute secondary gastritis are little known as the patients are not in a condition to be submitted to examination. Some cases of acute primary gastritis have been so examined and hyperæmia with submucous hæmorrhages and thick mucous secretion have been observed

SYMPTOMS—Any disturbance of the gastric function which gives rise to a burning sensation causes epigastric symptoms. Discomfort in the mid- or lower abdomen is likely to be due to coincident disturbance of the small and large intestine respectively. The sensation may be no more than fullness or discomfort but may amount to pain. Tenderness will usually be present but is diffuse, although mainly situated in the upper abdomen. Vomiting is common but hæmatemesis in spite of the presence of erosion and sub-mucous hæmorrhages, is rare. At first food is brought up but later the vomited material consists almost entirely of gastric juice, mucus and saliva. The acidity of the gastric juice tends to be low or absent and the vomit may even give an alkaline reaction from the mixture of mucus and saliva. In primary gastritis the constitutional symptoms will depend upon the severity of the irritation and also upon any toxic effects which the irritating factor may exert after absorption. There may be considerable prostration with headache, rise in temperature and tachycardia. In secondary gastritis the symptoms of the primary disease usually dominate the clinical picture

DIAGNOSIS—The acute onset, often related to an obvious indiscretion in diet or to the accidental or intentional ingestion of some irritating substance, may make the diagnosis relatively easy. But careful examination and a detailed history may be needed to exclude other acute abdominal conditions, such as cholecystitis, perforation, appendicitis, or lead colic. Leucocytosis may be present but it is not likely to be so severe as in acute infective or suppurative conditions. Certainly a diagnosis may be reached only by a process of exclusion and by the patient's reaction to treatment, for irritative primary gastritis rapidly improves with treatment and the acute symptoms rarely last more than two or three days. Probably the most difficult differential diagnosis is between acute gastritis of sudden onset and perforation of a peptic ulcer, as muscular guarding may be present in both. If there is serious doubt it is probably better to err on the side of diagnosing the condition for which surgery is indicated

TREATMENT—The main indication is to get rid of whatever it is that is causing the irritation. This will usually be achieved by the patient without assistance from his medical attendant but vomiting may be encouraged by giving copious draughts of a solution of sodium bicarbonate, 120 grains to the pint. If this should fail, the stomach can be washed out by tube with the same solution

As a rule, drugs are not indicated, but it is important to see that the bowels are active in cases in which constipation is a feature. No food should be given until the symptoms begin to subside but fluid is essential, especially if there has been much vomiting. If this continues for more than twelve hours a rectal saline-glucose should be administered, but in most cases it will suffice to give plenty of water by mouth. As soon as the vomiting has ceased diluted citrated milk can be started and the diet rapidly built up.

In *corrosive poisoning* the appropriate antidote should be administered and morphine may be required. Suppurative gastritis is usually fatal but if the condition localizes, operative treatment may be successful.

CHRONIC GASTRITIS

At the present time, especially in relation to the gastric disorders of men in the Services, chronic gastritis is a disease of the first importance. The thorough investigation which it has been possible to make in soldiers and sailors has shown how common the condition is, but there is no consistency of terminology or of classification. In the last twenty years or so the subject has been investigated from three different angles, namely, those of the radiologist, the pathologist, and the gastroscopist.

Since the introduction of a technique capable of displaying the pattern of the rugæ of the gastric mucosa on X-ray films, radiologists have recognized two principal variations from what is regarded as the normal. On the one hand the rugæ may appear greatly enlarged and thickened or, conversely, they may almost disappear. These two types have been called hypertrophic and atrophic gastritis respectively. That such conditions exist is generally confirmed by pathological and gastroscopic observations but it is not so universally agreed that the diagnosis can be confidently made by the radiological findings. For one thing the "rugosity" of the mucosa of the stomach is constantly changing and appears to be under the influence of emotion. The momentary finding of large thick rugæ, unless supported by other evidence of inflammation, is inconclusive, and the same applies to the apparent absence of rugæ on the X-ray film. From a study of stomachs resected at operation and material from autopsy, Faber (1935) described a chronic erosive gastritis associated with hyperacidity and a chronic diffuse atrophic gastritis associated with anacidity. As its name implied, the former was often found to be accompanied by multiple small erosions which were capable of giving rise to not inconsiderable hæmorrhages. Faber regarded this type of gastritis as the precursor of chronic peptic ulceration. A more detailed pathological classification, based entirely on histological findings, has been made by Keith Simpson but it has little value from the point of view of clinical diagnosis and treatment and need not be considered here.

Gastroscopic diagnosis has led Schindler to make a classification which has stood the test of twenty years and which fits in with the pathological classification of Faber. He recognizes four types—(i) Superficial gastritis, (ii) atrophic gastritis, (iii) hypertrophic gastritis, and (iv) gastritis of the post-operative stomach.

As the diagnosis of chronic gastritis can rarely be made except after gastroscopic examination it seems best to adopt the gastroscopic classification and this will be

TREATMENT—The principles of the dietetic treatment of chronic gastritis are the same as those for peptic ulcer. Meals must be small and frequent and their consistency completely non-irritating.

For superficial gastritis Schindler recommends complete rest in bed for eight days, with daily lavage of the stomach if there is much pus or mucus present. The benefits of lavage in gastritis are undoubted and I have used it successfully in quite a large number of soldiers. A recent case in which the treatment was unsuccessful was proved on gastroscopic examination to be a case of hypertrophic gastritis and the appearances were precisely the same after three weeks' treatment with lavage as they had been before treatment was started.

For the *hypertrophic form* a permanent post-ulcer regime, with complete abstinence from both tobacco and alcohol, should be instituted.

For *atrophic gastritis* the measures to be taken are slightly different. Although a bland diet is necessary there is no need for the strictness enjoined in the treatment of ulcer or the other forms of gastritis. Milk is best avoided, according to Schindler, and seasoning of food may be allowed. Hydrochloric acid is useful and often seems to give symptomatic relief. It is best administered as a beverage flavoured with fruit juice to be sipped after a meal, 60 to 120 minims of dilute hydrochloric acid (B P) may be used with up-to 10 ounces of water.

For *post-operative gastritis* the best measure is the undoing of the gastro-enterostomy. If this is impossible for mechanical reason, or on account of the general condition of the patient, lavage may be used.

PROPHYLAXIS—There remains for consideration the prophylaxis of chronic gastritis. Comparatively little is known about the etiology of the various conditions described but there is general agreement that tobacco is a factor in the production of superficial gastritis as well as in peptic ulcer. Alcohol is also well known to be a cause of gastritis. There is little doubt that mechanical factors play a part and the irritation of improperly masticated food may be responsible for chronic as well as acute gastritis. The part played by bacterial infection from the mouth and upper respiratory passages is more open to doubt but it is always wise to advise the dyspeptic patient to have his teeth in good order and to have all septic foci removed. Moderation in smoking and drinking, punctuality and regularity of meals with not too long intervals between them, are important preventive measures. All these points should be insisted upon in patients who show the slightest predisposition to suffer from minor digestive upsets, for in this way the development of the more serious and resistant forms of gastritis may be discouraged.

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*Note: The larger work, "Human Gastric Function" (Oxford University Press, 1943) is not yet available in this country.

GASTROSCOPY

BY A MORTON GILL, M D, M R C P

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THERE are few cavities in the human body into which the curious have not tried to pry, and the stomach is no exception, for various attempts at gastroscopy have been made during the last eighty years, a start being made with a professional word-swallower, who declined the honour after viewing the instrument, remarking that swords and not trumpets were his *métier*. The early instruments failed because illumination was so poor, the later ones, although widely used in Germany, were condemned in this country, because with the rigid tubes perforation of the lower esophagus and greater curve of the stomach was not infrequent.

However, with the introduction in 1932 by Rudolf Schindler of the flexible gastroscope a new era opened, for this instrument was safe, easy to introduce, less uncomfortable to the patient than most of the other endoscopes and gave excellent vision. Its chief defect lay in the fact that, since the flexible tip could not be directed by the operator, certain parts of the stomach, notably the roof or lesser curve of the pyloric antrum, frequently the site of ulcers, could not always be brought into view. Some two years ago Hermon Taylor's instrument, manufactured in this country, constituted a great advance, giving controllable flexibility and thus allowing inspection of the whole stomach in all cases and enabling a lesion to be seen in focus and at close view as desired. A biopsy attachment to the flexible instrument is in use in America, but it is not without risk of producing hæmorrhage and the piece of tissue removed is so small and macerated that its value is doubtful. Photography has been possible for some years but awaits the cessation of hostilities and the release of fast colour film in sufficient quantity to become universal.

PROCEDURE

The method of gastroscopy, originally unnecessarily complicated, has tended to become simplified with the passage of time, the increasing numbers of patients examined and the realization that the passage of the instrument presents no difficulty in the vast majority of cases. [The examination can be performed at any time of the day provided that the patient has taken nothing by mouth for six hours previously. Morphine ($\frac{1}{4}$ of a grain) is given hypodermically one hour before instrumentation and 1 tablet ($1\frac{1}{2}$ grains) of anethaine is sucked in the mouth until dissolved, twenty minutes before the patient is brought to the theatre. Although specially designed tables are available, these are not necessary and any standard theatre table is adequate: a back-rest can be attached to this and adds to the patient's comfort. With the patient lying on his left side, hips and knees flexed and a nurse supporting the head, the operator introduces the index finger of his left hand into the patient's mouth, feels for and hooks forward the epiglottis, while with his

right hand he passes the flexible tip of the gastroscope into the posterior pharynx and so down the œsophagus. Passage of the instrument is eased if it has been previously lubricated with K-Y jelly, glycerin, liquid paraffin or water. Only gentle pressure should be exerted, for the œsophageal mucosa is friable and easily injured. A slight increase of resistance is felt as the tip reaches and passes through the cardiac orifice into the stomach.]

The above method is subject to modification in a minority of cases. [If pyloric obstruction is suspected or known to be present, complete aspiration of the gastric contents by means of a Ryle's tube should be carried out half an hour before examination. Atropine 1/100 of a grain or hyoscine 1/150 of a grain is given as a routine with the morphine by many gastroscopists, but excessive gastric secretion never obscures vision and these drugs tend to reduce gastric motility so much that a clear view of the pyloric ring and pre-pyloric region cannot be obtained. Rarely, the introduction of the operator's index finger produces retching, indicating inadequate local anaesthesia. In such cases a gargle of 2 c.cm. of 2 per cent. decaine should be given in addition to the tablet. It is not always possible to reach the epiglottis with the index finger, and when this is so, the tip of the instrument having been passed into the posterior pharynx, the patient should be asked to swallow, when it will be found that the gastroscope slips smoothly down the œsophagus. Occasionally, owing to failure of relaxation of the cardia, the tip may be held up in the lower œsophagus. In the eventuality, patience is required, since relaxation will almost always occur within a matter of ten minutes. Strong pressure must never be used. The inhalation of a capsule of amyl nitrite will frequently induce relaxation in difficult cases. In particularly nervous patients a general anaesthetic is sometimes necessary, using a basal narcotic, followed by inhalation anaesthesia. In such cases the preliminary medication must not be omitted.]

Orientation—A few puffs of air will distend the stomach sufficiently to allow inspection of the mucosa and, with the patient in the position described, the lesser curve is seen with the lens directed towards 12 o'clock, the greater curve being brought into view by rotation through 180 degrees, so that the lens points towards 6 o'clock. A small pool of clear translucent mucus is seen collected here. The anterior wall is on the operator's left, the posterior wall on his right. In the fasting stomach, the pyloric antrum is usually deflated, the entrance to the antrum, at the incisura angularis, being indicated by a series of converging folds. These can be parted by the introduction of more air, when the tip of the gastroscope can be flexed, allowing the lens to move into a position where the pylorus and antrum become visible. After the whole of the antrum and the pyloric ring opening with each peristaltic wave have been viewed, the body and fundus should be examined methodically by withdrawing the instrument and rotating constantly in order to inspect the mucosa of the anterior and posterior walls of the lesser and greater curves. The cardia can be seen as the instrument is finally withdrawn. The whole examination, including introduction, does not average more than ten minutes, though special cases may take up to twenty to thirty minutes, for example, those in which it is required to study the secretory activity of the mucosa, watching the excretion of neutral red or the effects of histamine or insulin.]

Normal appearances—The normal mucosa of the stomach is described as being of an orange-red colour, the colour being light when the mucosa is in a resting state and becoming heightened and distinctly hyperæmic as local vasodilatation occurs when secretion has been stimulated, for example, after the parenteral administration of histamine or insulin, after the ingestion of concentrated malt extract and during the digestion of a meal. Emotion also produces alteration in the colour of the mucosa, with fear, pallor follows local vasoconstriction, whereas excitement and anxiety induce vasodilatation and increased reddening. The mucosa is thrown into folds or rugæ, which run longitudinally and are especially large and profuse along the greater curve. These folds tend to flatten somewhat as the instrument is introduced during the course of the examination but, if normal, they cannot be completely obliterated by air distension of the stomach. Apart from its colour and pattern of folds, the normal mucosa presents a glistening shiny surface, due

the fact that it is everywhere covered by a thin protective layer of clear translucent mucus. When actively secreting, the mucosa, in addition to its heightened colour, secretes a clear fluid which forms rivulets between the folds, trickling down to collect in a pool in the dependent portion of the stomach—with the subject lying on his left side, this pool forms on the greater curve of the body and fundus. The stomach is never still, it moves with respiration, transmitted arterial pulsation is often seen and frequent vigorous peristaltic waves are constantly occurring, being especially well marked in the antrum and causing the pylorus to open. Gastric motility is greatly increased by drugs which stimulate secretion, such as histamine and insulin, whilst the inhibitors, belladonna, atropine and hyoscine, also inhibit peristalsis to a greater or lesser extent.

INDICATIONS FOR GASTROSCOPY

At the present time it may be said that there are four major reasons for using this method of investigation—for purposes of research, the elucidation of chronic dyspepsia, the diagnosis of unexplained gastric hæmorrhage and the examination of patients prior to and after operations on the stomach.

(A) *Research*—The gastroscope has proved of value in the study of the normal physiology of the stomach, first in relation to the normal colour of the mucosa and its physiological variants in response to food and emotion, indicating the presence of local vasodilatation or constriction. Further control is obtained by using a thermo-couple to measure amount and rate of the blood flow. Secondly, in conjunction with test meals of various types and estimations of gastric juice for volume, acid concentration and peptic activity after stimulation of secretion, gastroscopy gives visual confirmation of the effects of such stimulation on the mucosa. Thirdly, motility can be gauged visually by gastroscopy, in addition to the usual balloon method of recording. Lastly, the study of the fold pattern is complementary to that in use by radiologists working with barium.

(B) *Dyspepsia*—In the elucidation of chronic dyspepsia, gastroscopy should be considered as being complementary to radiology, and it is particularly in those cases in which the X-ray findings are negative or inconclusive that help may be obtained. Moreover, apart from the initial cost of the instrument, gastroscopy is infinitely less expensive than a barium meal, its main disadvantage being that at present no permanent pictorial record of the findings is possible. It may be of value to consider the different lesions in some detail—

(1) Most chronic ulcers of the stomach are demonstrable radiologically but some are not, particularly those in which the crater is either shallow or very small, especially if situated on the lesser curve immediately above the angulus. In my own series, 17 per cent. of all chronic gastric ulcers were invisible on X-ray examination. Thus there is a place for gastroscopy when strong clinical grounds exist for considering a gastric ulcer to be present and yet confirmation is lacking by X-ray. An equally important use for gastroscopy in ulcer is for confirmation of healing, for it has been shown that an active ulcer exists for a period of a week or two after the X-ray appearances are those of complete healing. In other words, if recurrences due to incomplete healing and the premature return of the patient

to full activity are to be prevented, gastroscopic proof of healing, with epithelialization of the scar, is necessary

(2) Multiple small superficial erosions of the gastric mucosa, which the Wolffs have seen develop into chronic peptic ulcer, can only quite exceptionally be demonstrated radiologically and yet if, as seems likely, these are the immediate precursors of ulcer, it is of considerable importance that they should be diagnosed, especially as they quickly respond to treatment along ulcer lines and heal within a week or ten days

(3) The gastroscope is being used ever more widely in the diagnosis or exclusion of carcinoma of the stomach. Its use lies not only in the case in which the X-ray findings are suggestive but not conclusive, thus saving the patient an unnecessary laparotomy or alternatively further delay, but also in the case in which X-ray is negative, since the small nodule of early malignancy may be clearly seen by gastroscopy but fail to produce a filling defect with barium

(4) Hurst has remarked that, just as no one would diagnose tonsillitis without looking at the tonsils, so a diagnosis of colitis requires confirmation by sigmoidoscopy. In the same way chronic gastritis, which may be suspected on clinical grounds and have suggestive evidence as a result of test-meal and X-ray examination, should whenever possible receive that further confirmation offered by visual examination of the gastric mucosa. This is advisable so that accuracy in diagnosis may be attained, the extent and type of gastritis present be determined, and order that the effect of treatment can be followed. Chronic gastritis has been classified by Schindler into three types, superficial, hypertrophic, and atrophic and histological evidence, based on specimens obtained at operation, exists in this delineation. It is not known if these types represent distinct disease entities or if, as would appear more likely, they are different phases of a continuous pathological change. Certainly there are many recorded instances of an atrophic lesion developing out of a hypertrophic, transient superficial changes are often seen occurring as a superimposition on chronic atrophic and hypertrophic types and it is also not uncommon to see patchy atrophic and hypertrophic areas exist side by side in the same stomach. Of the three types or phases, the superficial is the most common and shows simply the changes seen in any mucosa which is inflamed—congestion, œdema, submucous hæmorrhages, thick adherent streaks of mucus and, in the more severe degrees, shallow superficial ulcerations. As in the case of ulcer, under efficient treatment the patient's symptoms clear long before the lesions heal and some are highly resistant to treatment, but in the majority of cases the mucosa returns to its normal healthy state within four to six weeks. The same cannot be said of the hypertrophic and atrophic forms of chronic gastritis, which would seem usually to be the result of permanent pathological changes in the mucosa and submucosa, not necessarily inflammatory in origin. Thus, one of the best examples of a permanent mucosal atrophy is seen in cases of pernicious anæmia, when gastroscopy reveals a diffuse atrophy, the mucosa becomes thin, the folds absent or scanty, the normal colour lost and replaced by a greenish yellow background with a fine network of submucosal blood vessels clearly visible, resembling somewhat the normal retina as seen by ophthalmoscopy. Such changes, whether diffuse or patchy, are also found existing without anæmia and

—although most are permanent, it is claimed that a few return to normal under treatment with liver or stomach extract. Certainly, in many of these cases the mucosa remains permanently atrophic, secreting little or no acid and pepsin, and the patient's dyspepsia is only relieved by strict attention to diet, a return of symptoms accompanying any indiscretion. It is not surprising that such individuals are frequently labelled as functional or neurotic dyspeptics, whereas in truth they possess stomachs the secretory activities of which are grossly impaired. The hypertrophic cases, on the other hand, are difficult to assess, for although, as has been said, histological confirmation of this condition is available in plenty, it is also true that on one visual examination alone it may not be possible to say whether the hypertrophy represents a constitutional change, a transient emotional reaction, or an inflammatory state. So it is that hypertrophic gastritis has become the subject of controversy and its frequency is in dispute. Its existence cannot be denied nor its association with chronic ulcer, especially of the duodenum, together with a hypersecreting stomach, pouring out a highly concentrated acid juice rich in pepsin. In a fully-developed case the appearances at gastroscopy are characteristic, the rugæ being large and tortuous, the fold pattern broken up to form cobble-stone areas and even, in the advanced cases, resembling sessile polyps (so-called gastritis pseudo-polyposa). As a result of fibrotic changes the folds are stiff and do not flatten with air distension of the stomach, whilst the mucosa itself has a velvet or sponge-like appearance, its colour is usually deepened.

(5) Other lesions, of greater rarity, are also found on occasion and explain an otherwise obscure dyspepsia—syphilitic ulcers, single benign tumours, liable to ulcerate and bleed, and malignant tumours other than carcinoma.

(c) *Gastric hæmorrhage*—The medical profession is indebted to Avery Jones for his careful gastroscopic study of hæmatemesis and his finding of acute ulcers of all sizes, single and multiple, in a majority of cases, within a week of hæmorrhage, the X-ray findings being negative. Thus it is known that, although it is neither advisable nor safe to gastroscope all patients who have suffered dangerous hæmorrhage from the stomach until their condition permits, it will nevertheless be found that an ulcer is responsible for the occurrence in most cases and that such ulcers tend to heal with great rapidity.

(d) *Gastric operations*—Owing to the high incidence of stomach and jejunal ulceration following gastrojejunostomy, this operation is not performed with the frequency and enthusiasm of an earlier day and the same complication, although less frequent, is not unknown following partial gastrectomy. It is to be expected that, along with estimation of the secretory capability and peptic activity of any given stomach, gastroscopy, by ascertaining the type of mucosa present, will play its part in the future in the guidance of the surgeon as to which operation should be performed in a particular case, and the chances of his work being ruined by the development of such post-operative complications. Meanwhile, in the elucidation of post-operative dyspepsia, gastroscopy is of considerable value, inasmuch as many of the lesions fail to be demonstrated by other means. Those of special importance and frequency are post-operative gastritis, usually of superficial type and responsive to treatment, erosions at the stoma, and peptic ulcer on the anastomosis or actually in the jejunum.

CONTRAINDICATIONS

There are certain cases in which gastroscopy should not be attempted, because the procedure would be either not without risk or entirely unprofitable. Examples of the first are —

- (1) Recent infection of the upper respiratory tract
- (2) Oesophageal lesions—varices, stenosis, neoplasm
- (3) Aortic aneurysm
- (4) Any illness with high fever or producing marked debility

The second group includes gross kyphoscoliosis and individuals with a rigid spinal column, making introduction of the gastroscope impossible or, if introduced, allowing of a hopelessly distorted view

COMPLICATIONS

It is so common for the patient to find his throat sore for a matter of twenty to forty-eight hours after gastroscopy that this hardly merits the term complication—the routine use of a simple gargle for a day or two is of value.

A rarer and potentially serious lesion is an oesophageal abrasion, which may result if undue pressure is exerted during the introduction of the instrument, especially if there is spasm or the patient is excitable and fails to keep still. The development should be suspected if the above pertain, the patient finds his throat to be extremely sore and accompanied by dysphagia, while at the same time becomes febrile. In most cases a polymorphonuclear leucocytosis occurs and unless the process is arrested, a para-oesophageal abscess, requiring surgical drainage, will result. Treatment consists in confining the patient to bed, giving boiled liquids only, by mouth, and a full course of sulphathiazole. The results are excellent, rapid resolution of all symptoms and signs occurring within a few days.

The most serious, and happily rarest complication of gastroscopy, is perforation of the lower end of the oesophagus or greater curve of the stomach by the tip of the instrument. The condition should be recognized immediately, for it is found impossible to distend the stomach with air and obtain a view, whilst X-ray taken with the patient erect, show the presence of air under both cupola of the diaphragm. Treatment is immediate laparotomy, with suture of the perforation or drainage without suture if the perforation cannot be reached, and the results are surprisingly good. Thus, in a series of over 20,000 gastroscopic examinations there were eight perforations, of which two, both oesophageal, proved fatal, the remainder making a complete recovery.

SUMMARY

The development of the modern flexible gastroscope is briefly outlined, together with technique of usage, indications for and value of the examination, contraindications to and possible complications of instrumentation.

DIGESTION IN DISEASES OF THE NERVOUS SYSTEM

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ANATOMICALLY, in the stomach, as in other parts of the gastro-intestinal tract, there are two nervous mechanisms —

(A) *The intrinsic mechanism* contains the plexuses of Auerbach and Meissner. Ehrlich (1934) considers, however, that in the synaptic mesh there is also a true myelinated network sending fibres to the muscles. This mechanism works primarily through local intrinsic reflexes, and its main function is coordination of muscular contraction. It carries on when all extrinsic nerves are cut; indeed then peristalsis becomes too active. The stomach is really autonomous, probably the nature and amount of gastric contents constitute the stimulus for myenteric reflexes, and it would seem appropriate to recall the words of an early Edinburgh physician (Whytt, 1751) "The distension of the hollow muscle has a remarkable influence towards exciting it to action." Surely this is the first mention of what moderns now as "adequate stimulus." The stomach is also affected reflexly through implicated neural connexions with other viscera, thus dyspepsias may result from a diseased appendix or cholelithiasis.

(B) *The extrinsic mechanism*—Normally, the fibres of the extrinsic system connect up with, modify and, in a general way, control the actions of the intrinsic nerves. The extrinsic nerves are the vagus (parasympathetic), and the splanchnics (sympathetic). These nerves have their higher centres in the diencephalon, where the parasympathetic group is located in the tuber-ventricular nucleus, the sympathetic group posteriorly, whilst the anterior supra-optic group influences both centres (Beattie, 1935). Fibres from these nuclei enter the pituitary, so that the diencephalon really constitutes the headquarters of the neuro-endocrine system (Roussy and Mosinger, 1933). Furthermore, parasympathetic centres have connexions with important subsidiary nuclei in the midbrain and medulla, and from the latter springs the vagus nerve, carrying parasympathetic fibres to the stomach. Only the effector part of this mechanism is indicated, but there are of course many "visceral afferents." Although similar to the ordinary sensory somatic nerves, the "visceral afferents" are nevertheless functioning afferents of the autonomic mechanism. The sympathetic supply to the stomach is delivered mainly by the splanchnic nerves. These two groups, the sympathetic and parasympathetic, belong to the autonomic system and, as first conceived by Gaskell in 1886, have opposing functions. It is considered that in the stomach, stimulation of the parasympathetic centres produces peristalsis, vasodilatation and secretion, whereas sympathetic stimulation produces stasis and vasoconstriction, with

inhibition of gastric secretion (Beattie, 1932, Cushing, 1932) In truth, however, this has never been demonstrated satisfactorily, probably because of the complicated union of these nerves with the myenteric plexuses, and because each extrinsic nerve carries impulses from both centres Nevertheless, the vago-sympathetic antagonism is quite clear and definite if the autonomic centres themselves are considered (White and Smithwick, 1942) If all extrinsic nerves were eliminated from the alimentary tract there would follow marked increase of the peristaltic movements, resulting in diarrhœa, and probably death from inanition The parasympathetic appears to produce conditions suitable for the digestion and absorption of food It builds up energy, hence its main purpose is anabolic activity If the sympathetic stops digestion, it mobilizes blood in the muscles, it produces a body ready for action The parasympathetic collects potential, the sympathetic provides conditions suitable for conversion of potential into kinetic energy The autonomic system is controlled largely by bodily states, somatic requirements and mental conditions, it receives afferent fibres from the thalamus and cortex, as well as from the viscera Normally, the autonomic, through the neuro-endocrine system controls the "internal milieu" of the body In health, digestive activities work smoothly, harmoniously, and almost unconsciously Fortunate people do not even know they have a stomach, but its function may be upset by many factors Willis, in 1664, conceived that the function of the visceral system was to place the heart and viscera in connexion with the brain, so that they could work in harmony More recently, Cannon (1932) has elaborated the concept, and termed it homeostasis

In addition to the diencephalic autonomic nuclei, there exists a cortical autonomic centre situated in the pre-motor cortex (Hoff and Green, 1937) This centre influences the diencephalon through mental percepts and concepts Savour odours produce a "psychic juice," whereas disgusting sights cause anorexia, nausea and vomiting Emotions markedly affect digestion All pleasant emotions, mental ease and soft music, are good stomachics, whereas unpleasant emotions, fear, anxiety, worry or weariness, inhibit digestion and may produce dyspepsia

It will be appreciated that there are many possible causes for disharmony in gastric function Gross disease of the nervous system, tumours, inflammation, degenerations or vascular lesions, may cause upset in cerebral and neuro-endocrine systems, with consequent upset of digestion Emotionalism may upset the diencephalon, or the whole nervous system may be affected through fatigue, strain or frustration In the absence of mental upset, there may be a constitutional instability of the autonomic itself, which makes for lack of integration, inordination and disharmony Both its mechanisms may be hypotonic or hypertonic or there may be an imbalance, with consequent upset of visceral function

This brief summary of the gastric nerve supply and function suggests a classification of the dyspepsias associated with nervous disorders —

- (1) Dyspepsias due to organic disease of the nervous system
- (2) Dyspepsias due to functional disease of the nervous system
- (3) Dyspepsias due to essential autonomic disorders

DYSPEPSIAS ASSOCIATED WITH ORGANIC DISEASE OF THE NERVOUS SYSTEM

In diseases of the nervous system, dyspepsias may form part of the symptomatology. These dyspepsias may be classified in the following manner—

- (a) Vomiting due to severe cerebral disturbance
- (b) Dyspepsias associated with disease of the autonomic centres
- (c) Dyspepsias due to disorders of the nerves or their plexuses

In the first group may be placed cases of cerebral tumour, with increased intracranial pressure, in which headache, vomiting and optic neuritis form the classical syndrome. In concussion, vomiting often takes place, indeed it sometimes helps to establish evidence for the concussional state. Frequently, giddiness, headache and vomiting are the initial symptoms of apoplexy. Dyspepsias and even peptic ulcers occur in cerebral birth injuries, in meningitis, but chiefly in tumours of the third and fourth ventricles.

In the second group, it is often noted that tumours, vascular degenerations or inflammatory changes about the diencephalon cause dyspepsia. Beattie has produced ulcer dyspepsia by stimulation of the tuber region of the hypothalamus. In medullary syndromes, vomiting is sometimes severe, and every physician recalls cases in which vomiting was the only symptom until later neurological signs indicated the nature of the malady.

In the third group, it is not quite clear how many dyspepsias can be attributed to the nerves themselves, but tabetic crisis is probably due to an abnormality in the visceral afferents, for antero-lateral cordotomy relieves it (Kahn and Barney, 1937). In this group also may be placed some types of spasmophilic disorders, such as achalasia at the lower end of the œsophagus. This is usually remedied by the passage of special bougies. Knight (1935) and Meade (1939) have reported only moderate relief of the condition by sympathectomy. There are other cases of cardiospasm, in which the only pathological findings were diminution or absence of neurones in the segment, which does not relax (Alvarez, 1939).

DYSPEPSIAS ASSOCIATED WITH FUNCTIONAL NERVOUS DISORDERS

This is a nervous indigestion, properly so called, and it constitutes a large group, which exhibits a varied symptomatology, mostly uncomfortable sensations which follow eating. Such symptoms may be heaviness, burning in the epigastric region, or distension of the stomach with gas, vomiting or regurgitation of food, and many general symptoms, such as palpitation, restlessness, insomnia, and so on. These symptoms do not make a diagnosis, but suggest careful consideration of the condition, mental and physical, and it should be kept in mind while so doing that the stomach is a sensitive indicator of emotional states. Purely nervous dyspepsia is the definite result of an upset mental state resulting in autonomic disharmony and dyspepsia.

There are two main groups of nervous dyspepsia corresponding in a general way to the extrovert and introvert type of personality, or, if preferred, to the pyknic and leptosomatic builds.

(a) *The hypertonic stomach*—Here, there is hypermotility and usually hyperacidity, which give rise to heartburn. The hypermotility appears at the cardiac

end of the stomach, giving rise to a feeling of constriction, which the patient endeavours to relieve by eructations. Perhaps he swallows air in order to distend the stomach, and so relieve the condition by eructation, or he may take bicarbonate of soda. If the spasm occurs at the pylorus, it suggests peptic ulcer. Indeed this type of hypertonic stomach may be the initial phase of a subsequent peptic ulcer, to be discussed later.

The patient with the hypertonic stomach is usually of an active, alert disposition, and if he becomes mentally upset, then the hypertonic type of dyspepsia is likely to manifest itself through overaction of the parasympathetic.

(b) *The asthenic stomach*—Here, the picture is different. The patient is of a different build. Motility and tone of the stomach are low, as usually is acid formation. The appetite is poor. After a meal there is heaviness, nausea, and frequently splashing in the gastric region. Digestion is slowed down, and vomiting may follow, with relief of discomfort. The patient is not often of a robust constitution. He has a low blood pressure, is easily tired, and is frequently anxious and introvert.

In both types, two points should be noted—

- (i) Many people have such physical phenomena in gastric functions but do not complain of any dyspepsia. There must therefore be another factor, and this is the irritable sensorium of the nervous individual.
- (ii) In either group, the patient tends to become a food fadist, and may perhaps starve himself in order to avoid the discomfort after eating.

To these two main groups of dyspepsia must be added mixed types. Some of these may be associated with overaction of both sections of the autonomic system (amphotonia), and others to weakness of both groups.

THE MANAGEMENT OF NERVOUS DYSPEPSIA is not a simple affair. It requires thought, tact and time. Each patient must be given individual consideration, for the method of attack varies with each patient.

(1) *Investigation of the nervous state*—Symptoms must be carefully noted and analysed. Frequently, early in the anamnesis, evidence of a nervous state will become apparent. Past illnesses are ascertained, and in every case careful systematic inquiries are made about many matters, e.g., work and any worries connected therewith, financial state, home circumstances, food, the time spent at meals, relaxation and recreation. Knowledge of the patient's ambitions, disappointments, difficulties and fears, are of special importance. The answers to these queries make it possible to estimate the patient's mental make-up and, with experience, his personality may be readily and truly assessed.

(2) *Investigation of the gastric state*—This should include examination of all systems. In many cases clinical examination will be followed by radiological investigation, and often by chemical examination of the gastric juices and stools. These special measures are useful, not only in establishing a diagnosis, but the reports are also of great therapeutic value. In nervous dyspepsia investigation will reveal an emotional disturbance, followed by dyspepsia.

PRINCIPLES IN THE TREATMENT OF NERVOUS DYSPEPSIA—Effort are directed towards correcting the neurosis and bringing about normal digestion. The diet should be soft, plain, good, and mixed, and should contain adequate

quantities of necessary foodstuffs and vitamins. In hypertonic cases it should not be stimulating, and it should not be tiresome, whereas in hypotonic types the diet should stimulate appetite and gastric secretion. In all cases meals should be properly cooked and daintily served, and it is of immense importance that the patient allow himself sufficient time at table. The dining hour is not a time for solving business problems. Inculcate habits of sound living, and make certain that adequate sleep, relaxation and exercise are taken.

With regard to the neurosis, difficulties should be frankly and freely discussed, and many troubles disappear in the light of full examination. The patient's troubles should be predigested and presented to him in an acceptable form. His ideas of illness should be corrected, and a sound philosophy of life encouraged. Mental help is a powerful therapy, indeed the main remedy in nervous dyspepsia.

Sleeplessness may be relieved by a little luminal or bromide. Alkalis are indicated in hyperacidity, whilst stomachics, abdominal massage, or even abdominal supports should be considered in hypotonic types.

These are principles. A very readable, excellent and detailed account of treatment is to be found in Alvarez's "Nervous Indigestion" (1939).

The results of adequate early treatment are excellent, but later cases may have developed organic troubles, such as ulcer, and these are not so easily dealt with.

DYSPEPSIAS ASSOCIATED WITH ESSENTIAL AUTONOMIC DISORDERS

There are innumerable cases of dyspepsia and peptic ulceration which result from an autonomic disorder occurring in the absence of any other disorder or disease. They are due essentially to dysfunction of the autonomic system, which usually works smoothly and efficiently, but when it does go wrong, there is upset in the inner environment." Some people inherit a tendency to autonomic imbalance. After a day's work, the sympathetic system has suffered loss, and parasympathetic hyperactivity shows itself in asthma, dyspepsia or colitis. It may well be that the nerve gradients to certain viscera are constitutionally abnormal. The pathway to the pulmonary viscera may be wider than the pathway to the stomach or colon. In other words, the gradients vary with different people, and in different circumstances, hence some get asthma, some dyspepsia and some colitis. Many stable people complain of symptoms identical with those of the hypertonic stomach. Ulcer is suspected, but radiological and chemical evidence is absent. Gastroscopic examination shows redness and irritability. Fractional test meal shows hyperchlorhydria. This condition is sometimes termed the pre-ulcer or pseudo-ulcer stage. Some clear up, but others go on with recurring episodes, until an ulcer becomes demonstrable. Initially, such cases are precisely similar to those of nervous dyspepsia, but in this latter there is difficulty in adaptation to external environment with consequent disharmony, whereas in autonomic dyspepsia the trouble is essentially and primarily a functional disorder of the autonomic nervous system. Ordinarily, feelings and desires associated with discriminative thought lead to action, but too frequently in the present state of civilization action is static, and if the organism is not adapted to static action there results autonomic disharmony.

A Brooklands racing model does not make a good stationary engine. It is

a fact that many alert, active, extrovert people, who are engaged in sedentary work, suffer from a peptic ulcer. Machinememen, bus drivers, and chauffeurs frequently suffer. Introverts do not suffer in this way, for they are more attuned to static action. In these matters only plausible explanations are yet possible. May it not be that the urge to action produces stimulation of the adrenergic nerve resulting in the production of adrenaline, which pours into the blood? Static action does not require adrenaline, and the method of its disposal is not established. Its action may be shunted to the stomach, where it lessens blood supply. Again while we eat we work, and when we eat we take food of the most appetizing type. This calls the gastric juices into action. Thus, we have amphotonia with spasmodic contraction of the gastric mucosa, local spasm of the terminal vessels and hypersecretion. Small areas are devitalized and acted on, with the result of irritation, and if the condition be prolonged, peptic ulceration. Recent work would tend to support this. Mann and Bollmann (1932) showed that prolonged exposure of the stomach to free acid produced irritation, inflammation and ulceration.

In these days of machines and motor cars, when people stand or sit and think but use their muscles very little, the results may be disastrous. An intention which has no outlet through muscle action may make other organs suffer. The new endocrine system of extroverts is tuned to muscular activity, and predisposed to disharmony by the absence of it. Autonomic dyspepsia may be determined by static action, and aggravated by stimulating foods. Peptic ulcer may result from a too fine adjustment to an environment which does not require muscular activity. Indeed Elton of Oxford (1941) points out that it does not always pay to be well adapted. The business man may win the struggle for cash, but may lose his health in so doing. Here it is pertinent to quote R. H. Tawney ("Sickness and an Acquisitive Society") "This obsession by economic issues . . . is a poison which inflames every trivial scratch into a malignant ulcer." It is reasonable to consider that peptic ulcer is a "somatic modification" resulting from the "acid modernity."

For the man of action the tyranny of industrialization and the paralyzing effect of machines and engines result in a static life which will jeopardize his health. The writing is on the wall, and the Atlantic Charter will not cure the malady.

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THE PSYCHOLOGICAL ASPECTS OF INDIGESTION

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THE psychological aspects of indigestion are most often considered as ways in which emotion, especially unpleasant emotion, can influence gastric and duodenal function for the worse. Recent experimental observations on human beings illustrate the problem better than the numerous animal experiments carried out by Pavlov, Cannon, and others following in their footsteps who studied the visceral manifestations of emotion.

Twenty-six people with peptic ulcer, gastritis or duodenitis, and thirteen people free from any gastro-intestinal disturbance were purposely made, while fasting, to experience disagreeable emotion, these feelings were aroused by talking to them about topics known to be painful and provocative to them. The characteristic changes observed while the subject was feeling resentment, anxiety, guilt or frustration, thus deliberately induced, were increased secretion of free HCl, and continuous active peristalsis instead of the milder periodic peristalsis that occurs during contentment and emotional quiescence. These changes occurred in all the dyspeptics and in half of the normal people, but they were more intense and lasting among the former. Often epigastric discomfort was experienced when the patient was angry or anxious, at the same time as his peristaltic activity and free HCl secretion increased. In a patient with duodenal ulcer, hæmorrhage also occurred when he was made angry, as was indicated by bright fresh blood in the gastric contents.

Since it is possible to demonstrate in many persons with peptic ulcer that they have felt long-standing anxiety, resentment, guilt or frustration, and since hyperchlorhydria is, by general consent, the common and possibly essential physiological feature of peptic ulcer, it has been concluded that baneful emotions contribute to the changes in function that cause dyspepsia and perhaps lead to tissue changes in patients with ulcer. There are weaknesses in this argument. Some observers, for instance, have noticed in man, and in other animals, that fear and rage may be accompanied by reduced peristalsis and HCl output. This occurred in only about half of the normal group referred to, but not at all in subjects with ulcer or gastritis. It may be that, like Pavlov's dogs, people can be divided into types, in one of which, the aggressive, their salivary and gastric secretion rises during and after stress, whereas in the other, made up of the timid and inactive, it falls, those with proneness to a rise are those prone to develop dyspepsia and ulcer.

Further questions then arise. What evidence is there of constitutional predisposition, and what is the mechanism whereby emotional upheavals can bring about the observed disturbance of gastric function?

THE "ULCER CONSTITUTION"

Constitutional predisposition has been studied and alleged to be recognizable in the physique, family history, and physiological peculiarities of the patient with peptic ulcer: the familiar fluctuations and recurrences of the illness, and the greater susceptibility of some races are also invoked as evidence. But more frequently than these signs of constitutional habit the peculiarities of temperament have been stressed: patients with ulcer are rarely casual and lethargic, they are

often—some would say, as a rule—highly-strung, determined people, conscientious, ambitious and active, driving themselves in an effort to attain a perhaps unattainable standard. It would be foolish, of course, to maintain that all ulcer patients exhibit such traits or even that such traits are known to be more frequent among them than among, say, a section of people holding responsible positions for which there is keen competition. Nor is it necessary that the man with these traits should wear them on his sleeve, he may worry but preserve outward calm, be resentful or alarmed but look self-possessed. The bulk of observations go further than to indicate that on retrospective inquiry a considerable number of patients with peptic ulcer report that they have been of a worrying, driving disposition, emotionally responsive and seldom content to be still.

EMOTIONAL FACTORS

The mechanism whereby the emotional peculiarities may be linked with the gastric changes in these patients is usually assumed to be autonomic, and some insist that vagotonia is a frequent and characteristic finding in peptic ulcer. To the latter opinion there are objections, it is probably unsafe to go further than to assume a labile autonomic nervous system in these patients. It has been possible in animals to produce experimental ulcers by lesions in the brain stem, prolonged stimulation of the vagus, or infusion of acetylcholine.

It has been repeatedly observed that worry or other emotional stress has a harmful effect on peptic ulcer; it may aggravate the symptoms or delay recovery. A history of some emotional upset occurring just before the onset of symptoms is often forthcoming. It is impossible to tell whether in such cases the injurious emotion has initiated the lesion or merely activated an existent lesion. Wolf and Wolff (1942) record some pertinent observations, made on a man aged fifty who had had a gastric fistula since the age of nine—

He was in excellent health and rarely had any digestive complaints. He was a sensitive, stubborn, conscientious fellow who was employed in their laboratory. Circumstances were such that during the period of the experiment he was at times sad, angry, frightened because of troubles in his daily life. It was found that under basal conditions small amounts of acid were continuously secreted into his stomach, and there were spontaneous transitory phases of accelerated secretion, accompanied by blushing of the mucous membrane and vigorous contractions of the wall of the stomach. Fear or sadness, however, led promptly to pallor of the gastric mucosa and inhibition of acid secretion and of peristalsis. The more aggressive emotional states, such as resentment of an insult, mortification or continuous anxiety, had the opposite effect: hypersecretion and hypermotility ensued; the mucous membrane (which was of course visible because of the fistula) became red and turgid, so that it presented the picture described by gastroscopists as "hypertrophic gastritis." At these times the subject complained of heartburn and abdominal pain, it was noticeable that contractions which would not inconvenience him ordinarily caused pain when the stomach wall was thus engorged. Moreover, the susceptibility to hemorrhage was much greater, as would be expected, vigorous contractions would produce bleeding points on the mucosa, without any external trauma. The bleeding points of erosions would usually heal within twenty-four hours or less, under their protective coat of mucus. But if the mucus were aspirated away any irritant, such as mustard, would cause acute inflammation, oedema, and bleeding points, stimuli that were ordinarily painless, such as pinching of the mucosa, would in this engorged state cause pain. In another experiment a small erosion was subjected to the action of the man's own gastric juice for four days, without any protective mucus. Within twenty-four hours the lesion had become deeper, and at the end of four days it was 4 mm. in diameter and had the punched-out appearance of a chronic ulcer, with a granulating base. It was then covered with petroleum jelly to protect it against gastric juice whereupon it healed completely within three days.

Wolf and Wolff emphasize that the gastric overactivity, consequent upon such

Emotions as hostility and worry, must act for a considerable period (as when a man broods over his troubles) if an ulcer is to result from it (presumably in a predisposed subject), and they instance, in support of this, the differing results obtained if histamine is administered in large repeated doses, or in a slowly absorbed medium so that its effect is sustained—it is the latter that does the damage. They conjecture that people who “blow off their steam” in words or actions are less likely to develop ulcer than those whose moods are not so explosive and short-lived. This is the kind of direct evidence at present available to relate emotional change to peptic ulcer. It leaves some important questions unanswered: the increasing preponderance of men among those with ulcer, for example. Explanations of this have been offered, which are unconvincing. But the importance of emotional disturbance in contributing to or aggravating ulcer may be conceded, without assuming that it has been proved to be wholly or mainly responsible. There are, of course, other factors to be reckoned with.

Since dyspepsia occurs in many who have not a peptic ulcer, the interest of the foregoing observations is wider than if it were solely a question of what causes ulcer. Many writers have pointed out how frequent are “functional” dyspepsias—“disturbances of the functions in the absence of recognizable anatomical changes or demonstrable disease in the stomach and duodenum and elsewhere in the body” (Tidy). If this disturbance of function is of the same kind as the disturbances observed in angry or frightened people, and if anger and fear appear to be unduly frequent in those suffering from the “functional dyspepsias,” it is reasonable to assume that the common cause helps to produce the common effect. Neither of these requirements is fully satisfied, but in so heterogeneous a group as the negatively defined “functional dyspepsias” it would be odd if they were. What is more important is that there is a considerable proportion in whom the conditions are satisfied, and the inference seems warranted. The described changes in acidity and peristalsis have been observed in a number of non-ulcer dyspeptics in the Services, according to some, about half of these patients have hyperchlorhydria and disturbed peristalsis. Emotional disturbances are found with at least equal frequency among them—in particular, partly suppressed resentment and anxiety. The care and objectivity with which the examination of the patient’s mental state is carried out will determine how often such emotions are discovered: uncooperative subjects and hasty interviews will bias the results in one direction, a convinced and persistent investigator may bias them in another. An average finding, probably, under war-time conditions, is that reported by Edwards and Copeman (1943) —

Of 217 “non-ulcer” dyspeptics, 101 were examined by a psychiatrist, who found an “abnormal psychological state” in 65 of them.

Unresolved tension is the most common state in such patients, with varying combinations of anxiety and depression. A German army doctor has reported that many men whose dyspepsia had cleared up while they were fighting in Poland had a recurrence when they were transferred to occupied France where they were comparatively inactive and (although he does not say this) isolated and hated. Unresolved tension would be an inevitable consequence of their situation.

NERVOUS DYSPEPSIA

Besides patients who show anomalies of secretion and motility attributable to morbid emotion, there are others whose complaint of indigestion may be an hysterical

or hypochondriacal symptom. A century and a half ago, Cullen found it necessary to draw a distinction between the two "neuroses," dyspepsia and hypochondriasis. It is worth remembering that in those days Lettsom could say "at least half of the diseases, to which we are prone, originate from the influence of the passions on the human system," and Falconer was then writing his scholarly essay on "The Influence of the Passions upon Disorders of the Body." Not long after, Barras in Paris was defending the thesis that a disturbed and hypochondriacal mind could only too easily consort with dyspepsia, which would disappear when the patient became serene or had a better object for his solicitude than his own stomach.

Gastro-intestinal symptoms are common and prominent among neurosis patients occurring in varying frequency (up to about 40 per cent) according to where the patients are seen (neurosis centre, medical out-patient department, general hospital) and how they have been referred and examined. It is not worthy that at a neurosis centre where, according to the psychiatrists' records, only 15 per cent of the patients complained, among other things, of dyspepsia, 35 per cent of these patients gave an affirmative answer to the intentionally vague inquiry (in a written questionnaire), "Do you suffer from stomach trouble?" and 21 per cent said they had at some time been on a special diet.

"Nervous dyspepsia" is not an illness—it is a symptom which may appear in a wide variety of psychiatric disorders, whether they be called neuroses or psychoses. As many schizophrenics and melancholics have had needlessly multiplied X-rays and test meals as patients with ulcer or gastric carcinoma have been mistaken for hypochondriacs, or sufferers from an anxiety state have had a laparotomy. The psychiatrist who has discounted a melancholic patient's complaint of dyspepsia until the ulcer perforated, and the surgeon who has mistakenly operated on a hysteric will have no desire for mutual criticism, but will agree on the variety of mental disturbances in which dyspepsia may appear as a symptom, and on the necessity for combining skill in detection of both mental and physical lesions.

Since nervous dyspepsia may appear in a wide range of psychiatric illnesses its prognosis and treatment will be those of the particular illness, and must therefore conform to the principles worked out for the different psychiatric syndromes. It is not a question of a special restricted diet, or, on the other hand, insistence on the repudiation of any dietetic restrictions at all. There is no particular drug regimen or psychotherapy that can be relied upon to do good for "non-organic" or "psychogenic" dyspepsia. The patient free from physical disease who complains that "her food lies heavy on her stomach," that "she feels sick and uncomfortable after her meals," that "she cannot eat because it upsets her so," cannot be diagnosed and treated unless the usual methods of psychiatric examination are employed, and there is no summary procedure which can obviate the need for this. It does not, of necessity, call for a psychiatrist to do it, but it calls for acquaintance with adequate methods of investigating and treating the psychiatric side of an illness. The psychiatric is often mixed with the social aspect, and the practitioner will do well to take both into account.

References

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 Wolf, S., and Wolff, H. G., (1942) *J Amer med Ass*, 120, 670

the individual's health is steadily being impaired his teeth are being undermined and lost. No better example could be found of a functionless part succumbing to disease.

The question of whether or not teeth are necessary to the proper assimilation of food, and therefore to good digestion, always excites controversy. In theory they should be, but the facts do not support the theory. All would agree that a set of clean healthy teeth in proper arrangement and used by their possessor as Nature intended them to be used, to grind up his food into a semi-fluid mass, ought to be an advantage to him in comparison with a toothless individual. But the advantage is one which paradoxically a great many individuals fail to utilize. Herbert and Bruske (1936), examining 500 English and 500 Dutch subjects, found a substantial proportion having front teeth only who masticated the test food better than another large proportion having a satisfactory complement of grinders. The fact is that the diet of modern civilized man does not require to be masticated.

In the prosthetic department of dental hospitals it is common to meet adults in a state of complete well-being who have been toothless for twenty or more years. When it is asked why they have come for artificial dentures it is always because of appearance and on the instigation of a son or daughter who desires to make the gift. There are still plenty of edentulous men and women in all classes of society who in the privacy of their homes take out their artificial teeth before they eat. More surprising still perhaps were the fractured jaw patients of the Croydon War Hospital. Many of these men had been transferred from France after months of treatment there with suppurating ununited fracture of the mandible. Here, under the care of J. F. Colyer (Sir Frank Colyer), their septic teeth were extracted and intermaxillary splints were used for fixing the fractured parts. Mostly, these patients could only take food by pushing it down the side of the cheek or through a space where teeth were missing. Yet these men, having been relieved of their sepsis, became healthy, strong enough to play football and put on weight.

ORAL SEPSIS

When digestive troubles are caused by the teeth, it is not absence of masticatory efficiency but preponderance of oral sepsis which is the cause. For example, Colyer (1911) cites cases of extensive dental caries in children treated by equally extensive extraction so that they became edentulous for the time being. The patients were weighed before and at intervals after treatment. All put on weight and the article concludes—"The cases quoted are sufficient evidence that the loss of masticating power does not interfere with the general health of the child, but increases the power of metabolism by removing a source of sepsis."

When it used to be the accepted order that a hospital patient, having had all his teeth removed, waited for six months before having his artificial plates fitted, it was repeatedly found that edentulous patients who had previously been toxic and suffered from indigestion had regained a healthy colour, had put on weight and had lost their indigestion.

William Hunter's paper "Oral Sepsis as a Cause of Septic Gastritis" (*The Practitioner*, 1900, 65, 611) is of classical importance. Speaking in 1913 at the Royal Society of Medicine in the special discussion on alimentary toxæmia, its

sources, consequences and treatment, in which fifty-six speakers took part, Hunter said that his studies which had been concerned with pernicious anæmia (1885) "commenced in the liver, had passed back to the portal blood, thence to the intes-

TABLE I

PERCENTAGES OF STREPTOCOCCI IN RELATION TO COLIFORMS IN 50 CASES OF TOTAL CLEARANCES

Case no	Before extraction	2 days after	2 weeks after	4 weeks after	2-4 years after
5437	16	9	7	5	
5438	7	5	4	4	8
5537	33	30	20	10	15
5690	28	24	18	16	18
5678	40	36	28	Not received	20
5679	36	33	25	20	22
5724	40	38	Not received	30	33
5689	40	35	30	22	
5739	6	5	4	4	All coh.
5608	35	33	27	20	
7076	28	26	20	12	11
7091	32	31	28	22	22
7088	33	31	25	18	
7089	37	35	26	20	All coh.
7094	25	24	20	16	8
7095	42	39	27	19	
8003	34	30	25	22	All coh.
8006	20	18	12	10	
8010	30	25	22	15	10
9002	40	37	30	22	20
9006	41	34	29	Not received	
9007	30	28	24	20	All coh.
9008	25	24	20	15	
9013	34	33	27	20	10
9014	44	43	36	29	8
9092	39	34	27	20	All coh.
9207	17	13	9	9	10
9208	43	40	37	24	
9216	28	26	20	15	8
9218	45	40	30	25	All coh.
9219	32	28	28	26	10
9220	12	10	10	9	All coh.
9231	22	19	18	10	
9232	28	23	20	15	
9233	31	26	20	20	
9236	32	31	25	24	
9237	45	41	35	33	
9256	46	41	32	30	
9307	31	31	28	28	20
9308	45	44	42	36	
9326	32	31	29	25	
9455	29	25	25	22	
9583	26	26	20	20	All coh.
9584	29	28	27	25	
9585	41	Not received	35	30	
9586	21	20	20	15	
9737	31	Not received	17	15	
9738	24	24	20	Not received	
9739	31	30	28	" "	
9740	27	24	22	" "	

Column 2 is taken 2 days after the first extractions, irrespective of whether the operation completed the extractions necessary

tine and stomach and had finally ended at the mouth" To him we owe the term "oral sepsis" which he denounced as "the greatest cause of infective disease in the body, and the chief cause of most of the disturbances in the alimentary tract,

THE INTERPRETATION OF PHYSICAL SIGNS

IV—IN ABDOMINAL DISORDERS

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IT is fair to say that physical signs in the abdomen have never been systematized by medical writers to the same extent as those in the thorax. Yet, just as in the case of the chest, the greatest care has to be taken to make correct observations. A mere cursory examination, especially when the abdominal disorder is an acute one, may well lead to a disastrous ending. In bed-side teaching, errors of observation are naturally more severely censured than fallacies in interpretation, for if a start is made with a wrong premise, how can a correct conclusion be attained? The well-proven principle of endeavouring to determine first the site of a lesion and then its probable nature is as true of the abdomen as of other parts of the body. Yet this article is primarily concerned with the interpretation of signs rather than with the differential diagnosis of diseases.

PROCEDURE OF EXAMINATION

The chief difficulty in elucidating physical signs in the abdomen is due to the obstacle which the abdominal wall places in the way of palpation. Contraction of the abdominal muscles, whether active or reflex, must be overcome. Active contraction of the muscles is sometimes brought about by a patient in the supine position raising his head in order to see the palpating hand of the examiner. Difficulty is not infrequently caused by a nervous patient keeping the diaphragm fixed and pushing down the abdominal viscera as soon as he feels the hand of the observer. In such cases he should be instructed to breathe deeply in and out so that the examiner, at any rate during expiration, may be afforded an opportunity of better access. It need hardly be said that the examination should be carried out in a good light and that the whole abdomen should be exposed. It is usually held that more complete relaxation can be obtained by raising the shoulders on a pillow, but it is often advantageous to have the shoulders at the same level as the rest of the body, the pillow which supports the head extending no lower than the neck. Drawing up the legs may favour relaxation of the abdominal wall but if they are held in a tense position this manœuvre may have the opposite effect.

The two chief procedures at the practitioner's disposal in the examination of the abdomen are *inspection* and *palpation*, and it is difficult to say which is the more fruitful in results. Inspection furnishes information as to the state of nutrition, symmetry, contour, mobility, abnormal appearances of the skin, visible peristalsis and pulsation. Palpation will be concerned with muscular tone and rigidity, hyperæsthesia, tenderness, pitting of the skin, the presence of a fluid thrill, abnormal pulsation, the outline of organs, and the possible existence of deep resistance and tumours. Under the heading of palpation must be included rectal examination, without which no examination of the abdomen can be said to be complete.

ABDOMINAL DISTENSION

The healthy abdomen being perfectly symmetrical any departure from the normal contour will attract attention. Such alteration may, on the one hand, affect the whole of the abdomen, producing general distension or retraction or, on the other, affect a limited area only. Uniform enlargement may be due to gaseous distension, fluid in the peritoneal sac, a tumour, cystic or solid sufficiently large to fill the greater part of the abdominal cavity, or to sheer corpulence.

When distension is occasioned by fluid there may be some degree of bulging in the flanks, whereas antero-posterior bulging is more common in flatulent distension. The presence of fluid is confirmed by noticing that bulging is greater on the side towards which the patient is inclined, and if he sits or stands the lower part of the abdomen becomes more prominent. A fluid thrill, the presence of alternating dullness when the patient is turned from side to side, and possibly finding that the upper limit of dullness on percussion has a concave border when the patient is lying on his back, will all betoken the presence of fluid. Since alternating dullness or rather resonance depends upon the ability of the gas-containing intestine to reach and float upon the surface of the peritoneal collection of fluid, this sign will be absent in those cases in which the mesentery has undergone infiltration and shortening, such as sometimes occurs in tuberculous peritonitis.

Flatulent distension may accompany and render obscure the presence of a small quantity of fluid in the abdomen. In these cases it is found that if the knee-elbow position be assumed percussion in the neighbourhood of the umbilicus, which previously gave a tympanic note when the patient was supine, will now yield a dull one owing to the presence of fluid which has gravitated from the pelvis.

I recall two cases in which the sole complaint made by the patients was that of flatulence and increasing size of the waist. Examination revealed signs not only of gaseous distension but of a little free fluid in the peritoneum. In both instances a pelvic examination revealed the existence of a malignant neoplasm of an ovary, the distension being due to pressure upon the bowel, whilst involvement of the peritoneum by the infiltrating growth had led to the exudation of fluid.

Flatulent distension of the intestine occurring in intestinal obstruction, megacolon (Hirschsprung's disease), or atony of the bowel, may lead either to general or asymmetrical enlargement of the abdomen, but in the typhinites of typhoid fever and in generalized peritonitis general enlargement is found.

A very large thin-walled ovarian cyst may be difficult to distinguish from ascites, convexity of the upper limit of dullness on percussion and finding that the distance from the navel to the anterior iliac spine is greater on one side than the other, and that the circumference at the umbilicus is rather less than at a slightly lower level, favour the diagnosis of an ovarian cyst.

An enormously distended bladder may cause general enlargement of the abdomen.

In one such case under my observation the bladder contained over ten pints of urine; in another over eight pints were present.

Finally, it should be mentioned that the existence of lordosis of the spine may be responsible for apparent distension of the abdomen.

superficial epigastric veins in the lower part of the abdominal wall (pouring their blood into the femoral veins) and the superior epigastric veins (eventually returning their blood to the superior vena cava) become an important by-pass for blood should there be compression of either the superior or inferior vena cava. These enlarged veins are usually seen extending from the middle of the groin to the costal arches. If the inferior vena cava becomes obstructed, the direction of the blood current in these veins will be in an upward direction. If such veins are found on one side only, obstruction of the iliac vein on that side will be indicated. Bilateral enlargement of the veins in which the blood is flowing in a downward direction will suggest pressure on the superior vena cava.

Although not at all common, another configuration of enlarged veins, known traditionally as the *caput Medusæ*, is sometimes seen in the region of the umbilicus in cases of multilobular cirrhosis of the liver. In these veins the direction of flow will be away from the umbilicus. By means of the para-umbilical vein the blood of the portal system is brought into communication with the systemic system of veins on the abdominal wall. When a *caput Medusæ* exists it may be concluded that the obstruction is situated in the liver itself, for the upper end of the para-umbilical vein opens into the left main branch of the portal vein. Pressure upon the main trunk of the portal vein before entering the liver, such as might arise from a carcinoma of the head of the pancreas or enlarged lymph glands in the lesser omentum, will therefore not give rise to a *caput Medusæ*.

VISIBLE PERISTALSIS

Even normally in very thin persons the peristaltic movement of the stomach and intestine may occasionally be seen, but when an ordinary state of nutrition of the abdominal wall exists the occurrence of visible peristalsis is usually indicative of some obstruction to the onward flow of their contents. In obstruction at the pylorus an appearance not very unlike the rolling of a golf-ball may be observed passing across from under the left costal margin towards the pylorus. This is a noticeable feature in cases of congenital pyloric obstruction in infants and is especially likely to be detected after the baby is fed, but a similar, if coarser, movement is not infrequently seen in cicatricial stenosis and malignant pyloric obstruction in adults. Visible peristalsis of the intestine is more commonly seen in association with chronic and subacute intestinal obstruction than with acute cases. It may be accompanied by gurgling sounds and griping pain, muscular rigidity is not usually present.

When the lower part of the small intestine is obstructed it is sometimes possible to distinguish in the central portion of the abdomen a series of intestinal loops standing out one above the other—the so-called ladder-pattern type of distension—as coil after coil, starting below, gradually becomes distended. With the passage of time the distension becomes general and the ladder-pattern can no longer be distinguished. If the obstruction is low down in the large bowel, distension due to swelling of the colon is seen towards the periphery of the abdomen, and in some of these instances it may be possible to observe peristaltic waves passing from right to left in the distended transverse colon. The importance of examining the hernial orifices in abdominal disorders of sudden onset cannot be stressed too highly.

In cases of intestinal obstruction early and repeated *vomiting* with only a moderate degree of distension implies involvement of the small intestine, and the higher the level of the obstruction the more pronounced and urgent does the vomiting become. When obstruction affects the large bowel, vomiting is less intense but distension is more marked. There is a type of case which sometimes causes difficulty in which symptoms of a high intestinal obstruction are followed by a period of abatement only to be succeeded after a day or two by signs and symptoms of obstruction at a lower level. Such a clinical picture should always suggest the possibility of obstruction being due to the presence of a gall-stone in the small gut. In these cases the gall-stone ulcerates into the duodenum from the gall-bladder, producing symptoms of a high obstruction. As the gall-stone gradually passes along the small bowel the obstructive symptoms subside. Owing to the gradual decrease in the diameter of the small intestine, as the lower end is approached the stone once more blocks the lumen and symptoms of obstruction reappear.

DIAGNOSTIC PALPATION

Normally the abdominal wall possesses elasticity, but this may be lost and be replaced by a doughy resistance, and notably so in cases of tuberculous peritonitis.

In cases of acute inflammatory disorder, palpation in particular will afford information of the utmost consequence. By its means the existence of muscular rigidity, of tenderness and of any abnormal swelling, if such be present, are discovered. Of all the signs of peritonitis, rigidity of the abdominal *muscles* is the most important. Local rigidity will suggest in acute cases local peritonitis, whilst general rigidity will point to general involvement of the peritoneum, as occurs when a hollow viscus has perforated. There are certain facts, however, that have to be borne in mind —

(1) In inflammatory lesions limited to the pelvis there may be a complete absence of rigidity of the anterior abdominal wall.

(2) Muscular rigidity may be very slight or absent, even though peritonitis is present, especially when the abdominal wall is fat and flabby, with poorly developed muscle, and in late stages of the disorder, owing to toxæmia.

(3) Rigidity, as already mentioned, may be present in cases of thoracic disease and in lead poisoning, but in neither of these instances is pressure likely to produce pain.

However, in the average abdomen, peritonitis is shown by an increase in the muscular tone of the abdominal wall, and the pain experienced by the patient becomes greater as the palpating hand presses in towards the underlying inflamed area. For example, taking the most common instance of local peritonitis, namely, *acute appendicitis*, the lower abdomen will be seen to be moving with respiration less freely than the upper zones, and the right side less than the left. The lower portion of the right rectus abdominis will be rigid and deeper pressure will elicit tenderness. *Tenderness* is particularly likely to be felt at a spot just below the mid-point of a line drawn from the right anterior superior iliac spine to the umbilicus or at McBurney's point at the junction of the outer and middle thirds of the same line. In children, the maximum area of pain and tenderness is often around the umbilicus. Hyperæsthesia, too, as tested by drawing a pin over the skin, is frequently present in the right iliac fossa.

be carefully palpated with the palmar surface of the fingers to determine whether its surface is smooth, granulated or bossed. In some persons there is difficulty in deciding whether "hob-nails" are present or not, the whorled arrangement of fat in the superficial fascia may give the impression, when the hand presses the abdominal wall towards the resisting surface of the liver, that these rounded irregularities are situated on the surface of the liver itself. In such cases it is wise to palpate in a similar manner the abdominal wall in other positions, if no such whorls are felt the presumption is that the case is one with irregularities on the surface of the liver. Even so, it may be difficult from palpation alone to decide whether a "hob-nail" liver is present or whether the liver is studded with innumerable tiny metastases. When bosses are felt it may be possible to recognize the presence of umbilication, if such be present this is strongly in favour of secondary carcinomatous deposits, although a gumma may sometimes show a depression on its surface. The consistence of the liver should be taken into account; a resistant smooth-surfaced liver with a distinct edge is found in lardaceous disease, but before making such a diagnosis other organs should be examined and etiological considerations taken into account. A smooth liver but much less firm, the lower edge of which it is difficult to feel, is suggestive of fatty infiltration, a condition not unlikely to be met with in the late stages of pulmonary tuberculosis. In the case of a fatty liver a much better idea of its size can often be obtained by percussion, on account of the difficulty of accurately determining the position of its edge by palpation. Even a gross enlargement of the liver may be missed by a medical student through neglecting to start palpating at a sufficiently low level.

The presence of tenderness should be noted. In a cirrhotic liver tenderness, if present, is usually ascribed to the existence of perihepatitis. General tenderness is often found in passive venous congestion (nutmeg liver) and slight tenderness often accompanies the presence of metastatic deposits. Localized tenderness is likely to be elicited when an abscess of the liver is approaching the surface.

An enlarged *spleen* possesses several characteristic features one alone will be emphasized here. When there is considerable enlargement and the question of distinguishing it from a renal swelling arises, the tumour is likely to be a spleen if a lack of resistance is found when pressure is exerted over the muscles intervening between the posterior border of the swelling and the spinal column, for most enlargements or tumours of the kidney pass well back into the loin and offer resistance to the fingers.

In a recent examination at Cambridge a patient with a prolapsed enlarged spleen was among the cases shown, but few of the candidates appreciated the value of such an observation in deciding the point.

An enlarged *gall-bladder* sometimes causes perplexity. It forms a smooth pear-shaped swelling projecting from the lower edge of the liver just outside the lateral border of the right rectus abdominis. As it enlarges, it tends to pass towards the middle line, so that when a patient is lying on his back it is unlikely to be found external to the mid-clavicular line. If it be examined bimanually, unless it has contracted adhesions, it can be made to display a sort of pendulum-like movement, the fundus passing through a bigger arc than the neck when pressure is exerted.

in a lateral direction, first by one hand and then the other. When enlarged secondary to malignant disease of the head of the pancreas it is usually painless, if full of stones it may be firm and tender, and it is usually elastic, tense and tender when forming a mucocele secondary to an impacted stone in the cystic duct.

The *pancreas* is not likely to be felt unless occupied by a tumour or when swollen and infiltrated by blood, as in instances of acute pancreatitis.

The *omentum*, when infiltrated with fibro-caseous material in cases of tuberculous peritonitis, is sometimes felt like a thick strand of rope passing across the upper part of the abdomen. A band of resonance can usually be found intervening between it and the costal margin. Less commonly it forms a similar transverse mass in cancer of the peritoneum.

When an *abdominal tumour* is discovered, the first point to be determined is whether it is a tumour of the abdominal wall or whether it is arising within the abdominal cavity. If the abdominal wall can be moved from side to side over the tumour the swelling is likely to have arisen in the abdomen. When a tumour lies in the abdominal parietes it cannot be moved apart from the wall, and when grasped by the hand the fingers can often be made almost to meet behind it. If it is superficial to the rectus abdominis it will become more prominent when this muscle is made to contract. If lying in the wall external to the rectus abdominis it will become more prominent if the patient is directed to shut his mouth, hold his nose and then blow. "Phantom tumours" are usually due to the contraction of a segment of the rectus abdominis muscle.

In the case of an *intra-abdominal tumour* of new formation an attempt must be made to determine its nature and ascertain its source of origin. This will entail observation as to its exact position, its outline, the character of its surface, its consistence, whether it is movable or fixed and whether it is pulsatile or fluctuant. A globular outline is characteristic of a fluid tumour (cyst), whereas a nodular surface is suggestive of a solid tumour. Although a nodular surface increases the likelihood of the neoplasm being malignant it is only necessary to instance uterine fibroids in conceding that simple tumours may present this feature. The consistence of a swelling may be informative, faecal masses, for instance, can often be moulded by pressure of the fingers through the abdominal wall. Tumours of the liver, spleen and kidney will move with respiration unless fixed by infiltration, and so will neoplasms of naturally movable parts, like the transverse colon, although in their later stages they may become fixed by the formation of adhesions or by their very size. Examples of tumours that do not move with respiration are new growths of the pancreas and aneurysms of the abdominal aorta. A mesenteric cyst can usually be made to move much more freely in a direction at right angles to the plane of the mesenteric attachment, that is to say it will be more freely motile in the direction of a line drawn from the right hypochondrium to the left iliac fossa.

Forcible pulsation of the abdominal aorta is sometimes mistaken for an aneurysm. No case should be diagnosed as an *abdominal aneurysm* unless a tumour that can be grasped between the fingers is felt, and the tumour thus palpated yields expansile pulsation. A systolic murmur can usually be heard over it and sometimes a thrill is present. An abdominal aneurysm is very rare in women, but forcible

acute rheumatism with danger of heart disease, chronic cases with acute "flare-ups," and acute articular rheumatism with clinical abnormalities. Cases of resistant sciatica and persistent rheumatism of infective type are also stated to respond well, and marked success was obtained in a case of severe chorea.

EARLY REHABILITATION IN ABDOMINAL SURGERY

UNDER this heading A. Shorter (*Lancet*, February 19, 1944, I, 243) gives a practical scheme of exercises to be carried out in bed after abdominal operations, and by means of which post-operative chest complications and venous stagnation can be prevented and muscular tone and joint efficiency preserved. Before operation the patient is instructed in breathing and coughing and a brief explanation of the exercises to be carried out post-operatively is given. Smoking is prohibited, so that a clear airway may be maintained. On the first and second post-operative days the patient, under expert supervision, practises thoracic breathing, coughing and retraction of the abdominal wall. To begin with breathing may be shallow and difficult, the chest must be laterally expanded in inspiration and gentle forced expiration is induced by manual pressure on the lower ribs. Patients may need reassurance before being persuaded to cough, particularly after operation for hernia, manual pressure is applied over the whole area of the operation wound, and the cough usually results in the release of much phlegm. Treatment is continued until breathing is free and the breath sounds clear. On the third and fourth days abdominal contractions, with the abdominal wall shortened in expiration and not held rigidly, and leg exercises, consisting of movements of the hip, knee, ankle and toe joints, are added. These exercises are increased on the fourth and fifth days and movements of the head and arms included. Provided there is no contraindication in chest or abdomen, by the sixth and seventh days the exercises can be done freely with full range of movement, and trunk exercises, in the form of extension, flexion, side-flexion and rotation are instituted, and the abdominal retractions are carried out with expiration. From the eighth to the fourteenth day the exercises are done three times daily, duration depending on the age and strength, stopping short of fatigue. Exercises for extension of the back and legs are added. After the fourteenth day the exercises become more strenuous, particularly those for the back, abdomen, glutei and quadriceps. Patients who have undergone appendicectomy by muscle-splitting incision are usually allowed up on the tenth post-operative day; thus the scheme of exercises is some-

what speeded up. Hernia patients get up on the seventeenth post-operative day. In addition to the physical benefits of the scheme, the patients' morale is maintained during the post-operative period. Rehabilitation in the form of graded exercises, games and light occupational therapy proceeds after the patient is up, and usually he is ready for discharge in one week, and two weeks later is able to resume work.

HIRSCHPRUNG'S DISEASE TREATED BY SPINAL ANÆSTHESIA

RECORDS of twelve cases of Hirschsprung's disease treated at the Hospital for Sick Children, Great Ormond Street, six of which are reported as cured for three years to nine months, three as improving, one as uninfluenced, and the remaining two under observation for too short a time to judge the results, indicate a more favourable prognosis for this disease than is generally assumed (Margaret Hawksley, *Brit. Journal of Surgery*, January 1941, 31, 245). The anæsthetic employed was light percaïne 1-1500, the dosage being calculated either as 1 c.c. per year of age of patient or by the Howar Jones formula. No basal narcotic premedication is used but just before the anæsthesia ½ grain of ephedrine is given intramuscularly. The percaïne, warmed to blood heat, is injected into the space between the second and third lumbar vertebrae while the child is sitting up, fifteen to twenty seconds should be taken for the injection. Refractory children can be given a little ethyl chloride while the injection is being given and then sat up. Children under three years of age are kept in the sitting position for fifteen seconds, over this age for twenty seconds. The child is then placed on its back in the reversed Trendelenburg position, and the position maintained for five minutes. The table is then tilted to bring the shoulders downwards. About twenty minutes elapse before the characteristic picture is obtained, the child appears pale, lies quietly and becomes drowsy. This lasts for about half an hour. Visible peristalsis occurs and then faecal matter should be removed manually. At the same time the degree of spasm at the pelvic rectal junction is assessed and, if contracted, manually dilated. Quantities of flatus are usually passed. After-treatment consists of washouts every other day, if spontaneous bowel action does not occur, and liquid paraffin each night. In some cases a weekly enema is necessary. Careful diagnosis of the condition is important. The main features are abdominal distension, constipation (sometimes spurious diarrhoea) and marked visible peristalsis. A warning is given against making a diagnosis on the evidence of one X-ray film of a barium enema.

REVIEWS OF BOOKS

Narco-Analysis By STEPHEN HORSLEY
Oxford Medical Publications London
Humphrey Milford Pp 134. Price
8s 6d

"A new technique in short-cut psychotherapy" is how Dr Horsley describes the procedure to the development of which he has himself notably contributed. It is hardly possible to define this method more accurately than as a combination of narcosis with psychotherapy. The narcosis is usually produced by intravenous barbiturate; the psychotherapy is not as a rule intensive. Dr Horsley ranges over many of the fields of application of narcotic drugs in psychiatry, and examines the points of similarity and difference between hypnosis and the method he describes. The book will be of use to those beginners in psychiatry who wish to make use of a time-saving substitute for some regular methods that demand patience as well as skill. At the present time, when hysterical disturbances of memory are usually common and this quick method of investigating and treating such conditions is in favour, a full account of all the recent articles and letters on the subject is not without value, but it would have been possible to present all the significant matter in much briefer compass.

R.A.M.C. By ANTHONY COTTERELL
London Hutchinson & Co (Publishers)
Ltd, 1944. Pp 116 Illustrations 24-
Price 6s

OPENING in a most attractive manner with the personal narratives of six wounded soldiers—an opening which succeeds in gripping the attention of the reader at the outset—the author proceeds to give a detailed description of the many activities and duties of the R.A.M.C. in modern warfare. Every branch of the service is covered, and the reader realizes, perhaps for the first time, the dangers and difficulties which have to be faced and the consummate bravery of all concerned, including the wounded themselves. In addition to being technically instructive the book is intensely human, and will thus be read with pleasure and gratitude by the general public as well as by those for whom it has a specific interest.

NEW EDITIONS

THE issue of the 1944 edition of *The Medical Directory* (J & A. Churchill, 63s) marks the centenary of its publication. The passing of

the Apothecaries Act in 1815 established the first boundary between the qualified medical man and the quack, and the publication of the first issue of the *Directory*, by Mr John Churchill, the founder of the firm of J & A. Churchill Ltd, and grandfather of the present Managing Director, with the object of correlating in one volume the names, qualifications and appointments of members of the medical profession, marked another step in the upward trend of medicine. A glance at the numerical summary of the medical profession in this, the 100th edition, shows the continuous growth in the numbers of those qualifying; in the year 1850, when the figures referred only to those practising in this country, the total of qualified medical practitioners was 10,962. In the year 1860 the names of practitioners in Scotland, Ireland and abroad were added, and ten years later those in the Services. A steady increase in the total figure has continued throughout the hundred years and for 1944 has reached 68,235, an increase of 1,495 on the figure for 1943. Both the medical profession and the general public owe a debt of gratitude to the House of Churchill for the publication of the *Directory*, and warmest congratulations are offered on the occasion of the appearance of the one hundredth edition.

THE six years that have elapsed since the appearance of the twenty-first edition of *The Extra Pharmacopæia*, Vol 2, by W H MARTINDALE (edited by C E CORFIELD, B SC., F I C, P H C, under the auspices of the Revision Committee of the Pharmaceutical Society of Great Britain) have witnessed many advances in medicine and chemistry, despite or in some instances because of the world war. The publication of the twenty-second edition (The Pharmaceutical Press, 27s 6d) will therefore be warmly welcomed. The new additions are many, but special interest may attach to the section on the use of penicillin in the treatment of wounds, the new sulphonamide derivatives, the inclusion of much new information in the chapter on the vitamins, and the further uses of the synthetic hormone stilbæstrol. The chapter on proprietary medicines now runs to fifty-eight pages and in addition to new preparations there is a useful section dealing with the provisions under the Pharmacy and Medicines Act, 1941. Congratulations are due to the editors and publishers for a war-time production which bears not the slightest trace of consequent economies and difficulties.

NOTES AND PREPARATIONS

NEW PREPARATIONS

HEPAMINO is a proteolysed liver preparation for use in the treatment of megalocytic anæmias. Clinical trials are stated to have shown it to be effective also in certain cases of pernicious anæmia in which there is sensitivity to or difficulty in procuring injections, and in anæmias refractory to the usual hæmatinic agents. The manufacturers are Evans Sons Lescher & Webb Ltd, Speke, Liverpool 19, and London, by whom Hepamino is issued in 5-ounce jars, price 15s (subject to professional discount). Literature can be obtained on application.

'WELLCOME' BRAND STERILIZED SULPHANILAMIDE is now issued in special protective sterile envelopes containing 5 gm powder in packings of 6, 25 and 100. This issue is in addition to the sealed 15 gm bottle pack. Another product, 'WELLCOME' BRAND STERILIZED SULPHANILAMIDE COMPOUND, is a finely divided, highly mobile powder containing in addition to the sulphanilamide 5 per cent zinc oxide. This latter preparation is suitable for surface wounds and should not be used for implantation into enclosed cavities. The manufacturers are Burroughs Wellcome & Co, 183-193 Euston Road, London, N W 1, from whom further particulars can be obtained.

INSULIN PRICE REDUCTION

As a result of further research which has led to an increase in the yield of insulin from pancreas, the British Insulin Manufacturers (Allen & Hanbury Ltd, Boots Pure Drug Co Ltd, the British Drug Houses Ltd, and Burroughs Wellcome & Co) announce a reduction in price of all brands of unmodified and modified insulin as from February 14, 1944.

SURGICAL RUBBER GLOVES

ANY practitioner or consultant requiring surgical rubber gloves for professional use should apply to the Secretary of the Central Medical War Committee, British Medical Association House, Tavistock Square, W C 1, marking the envelope "Gloves" in the top left-hand corner, and enclosing stamped addressed envelope for reply. He will then receive a booklet of six certificates for the year 1944.

THE EXTRA PHARMACOPŒIA

A SUPPLEMENT to volume 1 of the *Extra Pharmacopœia* (Martindale), twenty-second edition, 1941, has been issued in view of the many changes that have taken place during the

period since its publication. The supplement also contains the revised National War Formula, a resumé of the Statutory Orders concerning supply of drugs, and a list of new proprietary names not included in the 1941 edition. Copies can be obtained from the Pharmaceutical Press, 17 Bloomsbury Square, London, W C 1, price 2s.

PRESCRIPTION PADS

THE manufacturers of the PINOLEUM BRAND INHALANT announce that they have a limited number of prescription pads and refills, which may be obtained upon application. They point out that pinoleum brand inhalant can still be obtained with or without ephedrine to meet prescriptions from medical practitioners. Applications for the prescription pads should be made to the Chesebrough Manufacturing Company, Ltd, Victoria Road, Willesden, London N W 10.

OPERATIVE PROCEDURE

THIS is the title of a book published by Messrs Johnson & Johnson in America. The 81 plate of line drawings representing different surgical procedures, many of which have appeared in *Surgery, Gynecology and Obstetrics* and other surgical journals, have been carefully prepared in collaboration with the staff of the first named journal. These line drawings are beautifully done and should make a strong appeal to all interested in surgery. The book will shortly be published over here by Messrs Johnson & Johnson, Slough, Bucks, and will be obtainable at the price of 5s. Any profits from the sale of the book will be devoted to a medical charity.

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SULPHONAMIDES IN DERMATOLOGY

By H W BARBER, M B, B Ch, F R C P

Physician in Charge of the Skin Department, Guy's Hospital

IN an article on diseases of the skin caused by streptococcal infection, written in 1931, I said that "the discovery of an anti-streptococcal therapeutic agent, as potent in its action as are the organic arsenical compounds in syphilis, would abolish many acute and chronic diseases, the suffering and mortality from which are great." The advent of the sulphonamide compounds raised hopes that this prophecy might be fulfilled, and admittedly their discovery is one of the greatest advances in therapeutics of all time. Nevertheless, they fall short of the ideal envisaged for several reasons. Thus, whilst invaluable in acute infection by the hæmolytic streptococcus, the pneumococcus, the meningococcus and the gonococcus, they are far less potent against the less virulent strains of streptococcus and in chronic infections, and the risk of severe and dangerous toxic effects precludes their use over long periods. In penicillin, perhaps, has been found an equally or more effective substance without these disadvantages.

As with all new methods of treatment, the use of the sulphonamide compounds has been grossly abused. They have been, and still are, prescribed without rhyme or reason for conditions in which they could do no possible good, and might well prove actually harmful or dangerous. Not long ago I was assured by a patient, who had been an inmate of a cottage hospital, that to his certain knowledge all the patients, including himself, were being given sulphapyridine. This state of affairs is not only ridiculous, but reprehensible in the extreme. It reduces therapeutics to the level of the cure-all patent medicines, and the medical profession to that of their vendors.

LOCAL APPLICATIONS AND SENSITIZATION

Dermatologists, at any rate in this country, have on the whole been rightly conservative both in their use of these drugs and in claims as to their value in diseases of the skin. At the present time, however, there is a remarkable difference of opinion concerning their efficacy as local applications in pyodermias, such as impetigo, and the risk of sensitization that such treatment entails. It is extremely difficult to adjudicate fairly upon this controversy, since competent observers of experience hold diametrically opposite views.

The argument involves two main considerations, namely, first, whether or not the topical use of the sulphonamides is so superior to older methods of local treatment that it is justifiable to take the slight risk that sensitization of the skin to them may occur; and, secondly, whether or not the results of sensitization.

may be so serious as to preclude entirely the local application of these drugs superficial pyogenic infections

With regard to the first consideration some observers have compared the effect obtained in *impetigo and allied conditions* by this new method, e.g., sulphathiazole as a powder or in ointment and paste, with those produced by older remedies (Sams and Capland, 1941, Steigman, 1942, Cohen, 1942), and have claimed that the former were markedly superior and that no ill-effects occurred, but as Tate and Klorfajn (1944) pertinently remark, the older remedy selected in some instances hardly provides a fair comparison. Steigman, for example, chose dilute ammoniated mercury ointment, which no expert would prescribe for the actual stage of impetigo.

I have been at pains to obtain the opinions both of dermatological colleagues and of general practitioners. Some of the former have completely abandoned the use of sulphonamides locally for impetigo, not so much owing to the risk of sensitization, but because they found them inferior to agents previously used and the majority of the latter had come to the same conclusion.

Recently a medical man consulted me for an acute attack of facial impetigo. He was unwilling to take sulphathiazole internally, but agreed to try a 5 per cent proprietary preparation locally. On his own initiative he applied this on one side of his face and mercurial cream on the other. The latter proved far more effective.

My own opinion on this point is of little value because, being content with my habitual methods of local treatment of impetigo and other pyodermias, I have little experience of topical therapy with sulphonamides in these diseases. When I have prescribed it, I have seldom been impressed. Thus, in spite of the enthusiasm of many observers, I am not convinced that sulphanilamide or sulphathiazole afford quicker results than those obtained with older and eminently successful methods. My limited experience, in fact, is to the contrary.

The second consideration—the risk of sensitization—will be dealt with in the analysis of the recent paper by Tate and Klorfajn (1944). I have an impression—it is no more—that sensitization of the skin to external applications is more likely to occur with sulphanilamide than with sulphathiazole, and the statements of those who claim to have treated hundreds of cases of impetigo and other pyodermias with 5 per cent sulphathiazole paste without ill-effects cannot be ignored. On the other hand, sensitization of the skin to this drug does occur and according to the *Army Medical Dept Bulletin*, Nov. 1943 (no. 29, par. 22) "sensitization may follow the use of any of the sulphonamides, but the risk is greatest with sulphathiazole."

Lt-Col D. M. Pillsbury, who with his co-workers was one of the first to carry out carefully controlled observations on the local treatment of pyogenic cutaneous infections with sulphathiazole in an emulsion base (1941), has kindly informed me that he has seen several cases of sensitization to this drug, but that he has much less experience of the topical use of sulphanilamide. On the other hand, sensitization to *sulphadiazine* he has met with rarely, neither when it has been applied locally as a cream, nor when given internally. Sulphadiazine cream has in fact, been adopted almost as a routine application for impetigo in the American Army, and I accept without reserve Col. Pillsbury's opinion of its efficacy.

It is generally agreed that in the treatment of pyodermias with sulphonamides applied locally it is inadvisable to continue with them for more than five days, but even this precaution does not necessarily preclude the risk of sensitization. Although this risk has been recognized by dermatologists and others for some time past, an important contribution to the subject by Tate and Klorfajn (1944), based on their observations in the Middle East, has only recently been published. In considering their conclusions it should be noted that in nearly all their cases of sensitization, sulphanilamide had been the drug prescribed in ointment, pastes, or as a powder. In a few cases sulphapyridine was suspected. Consequently their conclusions do not necessarily apply to sulphathiazole, or to sulphadiazine. Their paper should be studied in detail, but the main points may be summarized as follows —

Incidence — During a period of six months out of 2,280 admissions to the skin department of a military hospital fifty-five were suffering from sulphonamide dermatitis produced by local applications of the drugs (2.4 per cent).

Clinical features — These were “those commonly observed in cases of contact dermatitis due to epidermal sensitization,” the eruption being an acute vesicular eczema. Except in two cases, not only was there the primary dermatitis at the site of application, but also a widespread secondary eruption on parts to which the drug had not been applied. In four instances this occurred only on areas exposed to light. In severe cases, constitutional disturbances with pyrexia were present.

Period of application — Out of thirty cases in which this was known with some accuracy, in eleven the dermatitis appeared within four to seven days, and in ten after seven to fourteen days. The important point was thus established that sensitization may occur after less than a week's treatment.

Nature of original disease — This point also is of importance. Out of the fifty-five cases fifteen had impetigo, and twelve ecthyma. Only two were cases of gunshot wounds. The significance of this will be discussed later.

Preparations causing dermatitis — Sulphanilamide in pastes, ointments, and powder was usually responsible, but in three cases sulphapyridine was suspected. No case is recorded in which sulphathiazole could be incriminated, but it may not have been generally available at the time these observations were made.

“Patch tests” — These revealed facts of practical and theoretical interest. In sensitized persons positive reactions were obtained both with sulphanilamide and sulphapyridine, no matter which drug had been the original sensitizing agent, but on the intact skin strong concentrations were required to evoke a reaction, which even then was generally weak, sulphanilamide producing much stronger responses than sulphapyridine. After light scarification of the horny layer strong positive reactions, practically equal with both drugs, were obtained. Sulphathiazole evoked no response on intact skin, and had not been tested after scarification.

Although the authors claim that the features of sulphonamide dermatitis were those of contact dermatitis due to epidermal sensitization, it should be noted that genuine patch tests, i.e., the application of the suspected irritants to intact and normal areas of skin, were positive only when sulphanilamide or sulphapyridine were applied in strong concentrations, and even then were weak, they were completely negative with sulphathiazole. As is well known, in cases of dermatitis venenata the application of the responsible agent, even in high dilution, to the intact skin usually provokes a strongly positive reaction. That scarification, i.e., exposure of the Malpighian cells, was necessary to obtain such a reaction with the sulphonamides appears to render doubtful the claim that the dermatitis they may provoke is strictly comparable to the common contact dermatitis. This is a point that requires further investigation. *The scarification test is not a genuine patch test.*

Internal administration of sulphonamides to sensitized subjects — In those who had had sulphonamide dermatitis and had recovered, the administration of a small dose of sulphanilamide, sulphapyridine, sulphathiazole, or sulphaguanidine provoked a relapse of the dermatitis (1) on the areas of skin previously involved by the primary and, if present, secondary eruptions, (2) at the sites of “patch tests.” In two cases with no secondary

eruption, i.e., without *general* sensitization of the skin, the recrudescence was confined strictly to the sites of the previous dermatitis

Duration of sensitization—The authors conclude that sensitization is probably permanent, three patients, for example, being still sensitive after eighteen, fifteen and six months respectively

Effect of sunlight—Exposure to sunlight favours the development of sensitization, and it would seem certain that more cases of sensitization are met with in tropical or sub-tropical climates than in temperate zones (*Army Medical Department Bulletin*, no 29, November 1943) As has long been known, the sulphonamides are photosensitizing agents, but their effect is not permanent

Desensitization—An attempt to desensitize the patients by giving minute amounts of the drug orally proved unsuccessful, but it was discovered by chance that if, despite the severity of the reaction, the drug were continued in moderate dosage (1 gm thrice daily) desensitization was achieved in several cases, and the "patch tests" became negative

These observations confirm those of Erskine (1939, 1941, 1942) upon sulphonamide sensitization provoked by oral administration of the drugs. He emphasized the important point that toxic reactions, including various types of eruption, may be due either to allergic hypersensitiveness or to drug retention. These two types of reaction may be differentiated by Werner's test of sulphonamide excretion. In patients with allergic sensitization excretion is normal, but with drug retention it is diminished, and there may be albuminuria and evidence of hepatic damage, such as urobilinuria. In the former case Erskine showed that desensitization could be effected by continuing the drug in the same or smaller dosage, and this is desirable owing to the risk of immediate violent reactions should it be given late to a sensitized subject. With drug retention, however, it is imperative the sulphonamide treatment be discontinued, lest serious and even fatal damage to vital organs result. Erskine rightly insists that the risk of these toxic reactions is minimized if sulphonamides are given for seven days only, or less. Tate and Klorfajn (1944) conclude that—

"topical sulphonamide therapy for skin diseases and minor injuries is unjustifiable and should be discontinued. It should be reserved strictly for cases where withholding it might endanger life or lead to deformity."

Against this it may be argued that in the majority of their cases the treatment had been continued for more than five days, and that apparently in none had sulphathiazole or sulphadiazine been employed.

One significant point to which these authors draw attention is that in only two cases of gunshot wounds and in none of severe burns was sulphonamide dermatitis met with. The explanation of this observation, of course, is that in eczematous dermatitis it is the Malpighian cells of the epidermis that are sensitized, and it is repeated contact of the sulphonamide with these, when the stratum corneum is destroyed or damaged, that provokes the eczematous response. Therefore it is in the treatment of superficial skin affections that this response may occur, and not in that of deep wounds or burns in which the whole epidermis has been destroyed. Epidermal sensitization to these drugs is particularly likely to result when they are applied to an eczematized surface, since the Malpighian cells are already sensitized. Finally, the authors remark that among thousands of cases, in which sulphonamides had been given *orally* not one case of eczematous dermatitis had been seen.

PRINCIPLES OF INTERNAL TREATMENT WITH THE SULPHONAMIDES

The diseases of the skin for which one or other of the sulphonamides may justifiably be given, or have been rationally tried, orally, are conveniently divisible into three groups — (1) Those caused by acute infections with various organisms, (2) chronic diseases due, or suspected to be due, to infective organisms, (3) certain eruptions that are or may sometimes be caused by bacteriæmia, or the circulation of bacterial toxins

The following table includes the majority of these diseases, and provides what is hoped are fair comments on the results of sulphonamide treatment —

ACUTE INFECTIONS

<i>Micro-organism</i>		<i>Disease</i>		<i>Results of treatment</i>
TREPTOCOCCUS	-	Impetigo contagiosa	-	Favourable
		Erysipelas	-	"
		? Pyoderma gangrenosum	-	"
STAPHYLOCOCCUS	-	Furuncle and carbuncle	-	Uncertain (sulphathiazole drug of choice)
		Granuloma pyogenicum	-	Good result reported but hardly indicated
		Circinate and bullous impetigo	-	Good results reported with sulphathiazole
DIPLOCOCCUS (Bullock, Demme)		Pemphigus acutus	-	Good results reported
BACILLUS OF SWINE ERYSIPELAS		Erysipeloid	-	Favourable
BACILLUS OF DUCREY-UNNA		Chancroid	-	Favourable
VACCINIA VIRUS	-	"Milkier's nodules"	-	Good result reported

CHRONIC INFECTIONS

<i>Micro-organism</i>		<i>Disease</i>		<i>Results of treatment</i>
TREPTOCOCCUS	-	Relapsing lymphangitis with or without elephantiasis		Good results obtained but uncertain
		Chronic streptococcal dermatitis with intertrigo		" " "
		Ecthyma	-	Seldom indicated
STAPHYLOCOCCUS	-	Sycosis barbae	-	Good results reported but doubtful permanent effect
		Pustular acne	-	" " "
		Hydradenitis suppurativa	-	" " "
		Infective eczematoid dermatitis	-	Good results reported but risk of sensitization considerable
VIRUSES	-	Lymphogranuloma venereum	-	Favourable if given in early stages
		? Dermatitis herpetiformis	-	Sulphapyridine of striking value but effect apparently temporary
		? Pemphigus vulgaris	-	Temporary improvement often occurs and even apparent cures reported but effect seldom lasting
		? Pemphigus vegetans	-	Cures with sulphapyridine reported other sulphonamides without effect

ERUPTIONS SOMETIMES OR ALWAYS CAUSED BY BACTERIÆMIA OR THE CIRCULATION OF BACTERIAL TOXINS

<i>Eruption</i>	<i>Results of treatment</i>
ERYTHEMA MULTIFORME - - -	} When caused by acute or chronic streptococcal infection may respond quickly by treatment of closed foci of infection essential
ERYTHEMA SCARLATINIFORME - - -	
ERYTHEMA ANNULARE CENTRIFUGUM - - -	
ERYTHEMA INDURATUM (streptococcal form) - - -	
LUPUS ERYTHEMATOSUS - - -	The streptococcal form may respond well but reactions often severe, particularly in acute cases. Removal of closed foci of infection should be effected first. Tuberculous form non-responsive
PUSTULAR PSORIASIS AND PUSTULAR DACTYLODYSPLASIA OF THE EXTREMITIES	Apparently always due to bacteraemia or toxæmia from an acute or chronic streptococcal infection. Sulphonamides of value in acute cases and in chronic ones if the eruption does not respond completely after removal of closed foci of infection

DOSAGE

The dosage and duration of treatment must obviously, depend upon whether the disease is acute or chronic. In acute diseases the principles are simple and generally agreed upon, namely to give full doses on the first day of treatment in order to obtain an adequate concentration of the drug in the blood rapidly, to space the doses so that the concentration is maintained, to reduce the dosage slightly on subsequent days, and to omit the drug after three or four days if the desired effect has been obtained, and in any case to do so after a maximum of seven days' treatment. In an acute and severe case of impetigo contagiosa, for example, in which disease I employ sulphathiazole, the following scheme of dosage is recommended—2 gm. are given with a tumbler of water at 8 a.m., 4 p.m., and at bedtime on the first day, and 1½ gm. at the same times on each of the two or three succeeding days—a total of 15 to 19½ gm. In the majority of cases this treatment, combined with simple antiseptic local applications, will bring the eruption under complete control.

No definite scheme of dosage can be laid down in cases of chronic infection. Formerly I gave relatively small doses and continued the drug for a fortnight, or until symptoms of intolerance occurred, such as drug fever, gastro-intestinal disturbances, or some diminution in the white-cell count. I now prefer to give a short intensive course of treatment for a week or less as for acute infection, and if necessary repeat this after a while, or give small doses for a longer period. By this method the risk of drug sensitization and of serious toxic effects is diminished.

I cannot here discuss the possible manifestations of allergy to, or toxæmia from, the sulphonamides. They are admirably summarized in a table reproduced in the "Manual of Dermatology" by Pillsbury, Sulzberger, and Livingood (1943) and the more important are now well recognized. From this table it would appear that sulphadiazine is the least noxious, but this may be partly due to its restricted use. Sulphathiazole is less toxic to the bone marrow and liver than sulphanilamide or sulphapyridine, but like the latter is liable to cause hæmaturia unless copious fluids are taken during treatment.

Needless to say, when repeated courses of sulphonamide therapy are prescribed, or when the drugs are given in small dosage over a considerable period, it is imperative that repeated blood examinations be made, that the urine be frequently tested for evidence of hepatic or renal damage, and that the possibility of fluid retention be borne in mind.

A most important precaution before prescribing any of the sulphonamides is to find out if the patient has previously been treated with one of them, since violent and even dangerous reactions may result even from minute doses in anyone who has been sensitized.

THERAPEUTIC DATA

Some additional comments on sulphonamide therapy in a few of the diseases listed in the table on pages 285-6 may be of value —

Erysipelas — There is no doubt that the duration and mortality rate of the acute form of erysipelas have been materially reduced since the sulphonamides were introduced. Except in old and feeble persons and in those with serious organic disease, the death rate is now almost nil (Snodgrass and Anderson, 1937, Rantz and Keefer, 1939, Hoyne, Wolf, and Prim, 1939, Shank, Maxwell and Bozalis, 1941, Siegel, Rosove, and Bower, 1942).

Chronic streptococcal dermatitis with recurrent erysipelas — Efficient local treatment of the foci of infection in the skin (intertrigo, fissures in the folds or at mucocutaneous orifices) is essential, but sulphonamide therapy, if employed judiciously, may be of great value.

One patient under my care, who after an attack of scarlet fever had suffered for sixteen years from widespread streptococcal intertrigo, and had had five attacks of erysipelas, recovered quickly and permanently under treatment with sulphanilamide when local measures had failed to prevent relapses.

Should, however, elephantiasis result from the recurrent attacks of lymphangitis the prospect of complete cure is uncertain. In such cases I rely chiefly on *intra-dermal* injections of streptococcal vaccine given over a long period, but sulphonamides should be tried. Mercer (1939) records a successful result in a case of recurrent lymphangitis with elephantiasis of the upper lip treated with sulphanilamide, 20 grains per diem, for three periods of two months' duration. I prefer to give short intensive courses with intervals of rest, if the patient can be closely observed.

Impetigo contagiosa — The bacteriology of this disease will not here be discussed. The eruption in its typical form is, as Sabouraud maintained, primarily caused by *Streptococcus longus*, secondary invasion with *Staphylococcus aureus* occurring rapidly. The circinate or gyrate form, and certain types of bullous impetigo, including pemphigus neonatorum, appear to be primarily staphylococcal.

As regards sulphonamide treatment, different opinions are held — (1) Some consider that, since the eruption is curable by other methods, the sulphonamides should not be prescribed either locally or internally; (2) others regard topical therapy with sulphathiazole or sulphadiazine as so effective that oral administration

is unnecessary and unjustifiable, (3) others, like myself, prefer alternative methods of local treatment, but in severe or resistant cases prescribe a short intensive course of sulphathiazole internally as described above, and, finally, (4) there are some who combine local and internal treatment with sulphathiazole

I am much indebted to Dr Laurence Martin for permission to record his experience of 250 Service cases treated exclusively with sulphathiazole. His findings and conclusions are briefly as follows—(1) The combination of oral and local treatment is statistically better than either alone, (2) the optimum oral dosage is 24 gm in four days (2 gm thrice daily), (3) 5 per cent paste is probably the best form of local application, (4) with this combined treatment cure is obtained in about 8.5 to 9.0 days, (5) no case of sensitivity to sulphathiazole has been observed in primary impetigo, but *sensitization occurs frequently with either local or oral treatment in cases of impetiginized eczema*

A point of interest is that Dr Martin does not allow the crusts to be removed, since "they dry up and drop off in 48 to 72 hours" with the combined treatment, whereas Lt-Col Pillsbury and others stress the importance of their frequent and thorough removal when local applications of sulphathiazole or sulphadiazine in paste or cream are employed alone.

Dermatitis herpetiformis (Duhring's disease)—The causation of this disease and its relationship to pemphigus vulgaris are still a matter of controversy. Some insist that it is essentially benign, whereas pemphigus is almost invariably fatal, but there are cases in which in the early stages the eruption has all the characteristics of dermatitis herpetiformis but gradually assumes those of the more serious disease. Both conditions, to my mind, like lichen planus, possess the hall-marks of virus infection, although this has not been proved as yet. The provocative effect of potassium iodide, and to a less extent of bromide on dermatitis herpetiformis supports this view, since the activating influence of certain drugs upon known viruses (the biotropism of Miham), such as those of herpes simplex and zoster, is well known. These two eruptions and lichen planus appear not infrequently during medication with injections of arsenical compounds and gold, and zoster occurred in epidemic form during the outbreak of arsenical poisoning in Manchester in 1900.

As regards the influence of sulphonamides on dermatitis herpetiformis, the fact that sulphapyridine is far more effective than sulphanilamide, and than sulphathiazole or sulphamezathine, would point to the disease being due to a specific infective organism, if not necessarily a virus. The same is true of pemphigus. It is common experience, however, that both diseases relapse when the drug is discontinued. In some cases of dermatitis herpetiformis, after an initial short course of full doses, I have succeeded in keeping the patient almost free from his eruption by prescribing one tablet daily or even every second or third day, and no toxic effects have so far been observed.

Lupus erythematosus—Since it was first suggested (Barber, 1915) that this disease might sometimes be an acute or chronic reaction of the skin to streptococcal infection, this view has received considerable support, and my experience has not altered the opinion I then expressed that some cases are of tuberculous and others of streptococcal origin. I hold the same opinion concerning a group of eruptions

that may be regarded as related to lupus erythematosus, viz erythema nodosum, erythema induratum, and granuloma annulare I have discussed this question elsewhere in detail (1929, 1940, 1941)

The treatment of the streptococcal form of lupus erythematosus with sulphonamides presents features of peculiar interest and difficulty owing to the severe reactions, distinct from drug fever, that often occur (Barber, 1941) Several other observers have reported cases treated by this method with varying results (Hruszek, 1939, Weiner, 1940, Wile and Holman, 1940, Propert, 1940, Combes and Canizares, 1941)

My own procedure is first to investigate each case fully in order to determine if possible whether tuberculous or streptococcal foci of infection are present. If it is decided that the eruption is probably of streptococcal origin, closed foci are dealt with and sulphonamide therapy is instituted. I now prescribe a short course of not more than a week with full dosage, and repeat this at intervals if necessary, but I seldom undertake such treatment in this disease unless the patient is prepared to remain in bed under close observation. *In the acute form of the disease, however, extreme hypersensitiveness to sulphonamides is almost always present, and minute doses should be given at first until the patient's tolerance is determined. These cases, as is well known, often terminate fatally with streptococcal septicæmia.* Erskine (1938) and I consider that particularly in lupus erythematosus some of the reactions caused by the sulphonamides, e.g., a scarlatiniform erythema, are due not to the drug, but to liberation of streptococcal toxin from foci of infection.

One point of some interest, which I have not seen recorded, is that thoroughunction daily of patches of lupus erythematosus with a 5 to 10 per cent. ointment of sulphanilamide in lanolin will in some cases produce striking improvement. As a rule this is preceded by a reaction in the eruption comparable to that which may occur when sulphonamides are given orally. I have never seen epidermal sensitization, i.e., an eczematous reaction, result from such treatment.

SUMMARY

- (1) The sulphonamides are effective in the treatment of certain diseases of the skin, both when given internally and as local applications
- (2) Both methods of administration demand the most careful surveillance owing to the risk of allergic hypersensitiveness of the skin and other tissues, and of serious toxic effects on the liver, kidneys, and hæmatopoietic system
- (3) It is important to distinguish between allergy with normal excretion of the drug and toxæmia with drug retention. In the former, desensitization can be achieved by further administration, in the latter, it is imperative to discontinue the treatment
- (4) The risk of allergic hypersensitiveness and of toxæmia is minimized by prescribing the drugs orally for short periods only (three to seven days), and by applying them locally for not more than five days
- (5) It is questionable if, as has been claimed, the use of sulphonamides as local applications in superficial infective dermatoses, such as impetigo contagiosa,

possesses any advantages over rational treatment with older and safer remedies. In any event, long-continued topical therapy with sulphonamides should never be permitted.

(6) The diseases of the skin for which the oral administration of sulphonamides has been employed with complete or partial success may be divided into (a) acute and chronic infections of the skin itself with various micro-organisms, and (b) certain toxic eruptions due sometimes or always to acute or chronic infections situated elsewhere than in the skin.

(7) In some diseases the efficacy of one member of the sulphonamide group may be greater than that of the others. It is well known, for example, that sulphathiazole is more effective than sulphadiazine in staphylococcal infection, and sulphapyridine appears to be the drug of choice in dermatitis herpetiformis, pemphigus vulgaris, and pemphigus vegetans.

I am indebted to Brig-Gen R M B MacKenna, R A M C, for valuable help in the preparation of this article.

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SCABIES

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"I now set about erecting a hut for myself and wife, resolving if possible not to mix blankets with so many bedfellows again. This I was the more anxious to do because at that time the whole of the men were affected with an eruption of the skin similar to the itch."—Sergeant Anton in "Wellington's Men, Some Soldier Autobiographies" Edited by V H Fitchett London, 1912

MRS BEETON is supposed, quite untruly of course, to have prefaced her receipt for juggling by "first catch your hare." The preoccupation of the dermatologist may lead him into a similar train of thought. "first catch your scabies," surprisingly simple issue upon which there is surprisingly little agreement, but one which nevertheless holds the key to and controls everything that will be discussed in this article.

In some quarters the complete answer seems to have been found in the sleeping partner—an important factor, no doubt, but only one among several. Therefore as a beginning and merely as a basis for discussion I shall here recall that Small and I credited blankets and underclothing, "mangy" horses, and infected women, as the chief source of scabies in the Army in France during the war of 1914-1918. These separate conditions can again be considered, but in a reverse order, leaving out horses because, mangy or otherwise, they have been replaced by tanks and jeeps. Scabies may be, and sometimes is, truly venereal in origin, meaning by that contact, and undressed contact, with a harlot in her bedroom—not the alfresco congress such as it may be considered the removal of railings from parks and other open spaces has made increasingly possible. Although venery plays a part in disseminating scabies, it is in another sense that the sleeping partner continues to be an active agent in spreading disease as in the following imaginative but not improbable sequence—

An honest housewife contracts scabies but six weeks may elapse before the signs mature, and frequently a month more before their nature is recognized. During this ten-week period she contaminates her husband on his leave, her sister who has stayed with her, and her evacuated children to whom she has made a country visit and from each of these sources new foci of disease develop and spread, a sort of ferocious scabiectic metastasis which could have been effectively prevented by early diagnosis and treatment.

How the honest housewife caught the itch, however, has yet to be explained. Experience and the practising of medicine have shown that prolonged and intimate contact with a contaminated person or thing are necessary conditions for infection. But for months before the events imagined above no one, it is presumed, had stayed with her, nor had she been away from home, she is not whorish or dissipated, and unless enlightenment comes by way of some sort of symbolic aruspication, or in some other manner, then the theory of infected blankets and clothing has to be investigated. On this question, of fomites as instruments of infection and re-infection, the distinguished investigations carried out by

Dr Kenneth Mellanby and his co-workers have completely reversed the hitherto accepted opinion and have shown that the supposed infectivity of fomites has been greatly exaggerated, and that the risk of contamination from them is, within reason negligible. Whether Hebra should be picked out, as is so often done, as the enlightened exception who in 1868 maintained that blankets played little part in the spread of the disease and that their sterilization was unnecessary is very much open to question. Blankets are never mentioned by Hebra either directly or by implication. He talks of personal clothing, modestly stating his *provisional* opinion in which he clearly does not believe, for he orders clean linen after treatment and entertains his readers with a version of the Biblical story in which he converts Naaman's leprosy into scabies, as the disease passed to Gehazi must have been, because scabies is "communicable by contact and by wearing the clothes of those affected by it." If there has been no personal contact with another, then there is still no answer to the question "where and how did the patient pick up the disease?" Mellanby allows that "bedding is certainly able to transmit scabies" and that "communal blankets used by fire-watchers offer some risk," to which I am bound to add in fairness to him that these sentences have been taken from their context which shows that he regards such risks as negligible, and that he has provided good evidence in support of his thesis. I leave the reader with an interesting problem which he and I will endeavour to solve "on the case" by analysis of the facts which come under observation in the rough and tumble of practice.

TYPES OF SCABIES

Scabies is noticed in three forms—uncomplicated or straight scabies, scabies complicated by pyoderma, scabies complicated by eczema or dermatitis. In these three varieties, diagnosis relies upon the type of the eruption and its distribution.

Uncomplicated (straight) scabies—Three types of lesion are present—(1) the scratched or follicular papule of which most of the eruption is composed, (2) vesicles, (3) burrows, that is to say curved or angular lines representing the tunnel made by the female parasite, which can often be seen at one end as a speck just under the surface. The scratched papules are collected and grouped about the anterior axillary folds, and over the abdomen in a circle centred by the umbilicus. A raised reddish round or linear blob is often observed on the axillary fold and rim of the navel, a most characteristic reaction of the sensitized scabetic skin. The pin-head vesicles and the burrows are mostly on the hands and wrists, especially on the

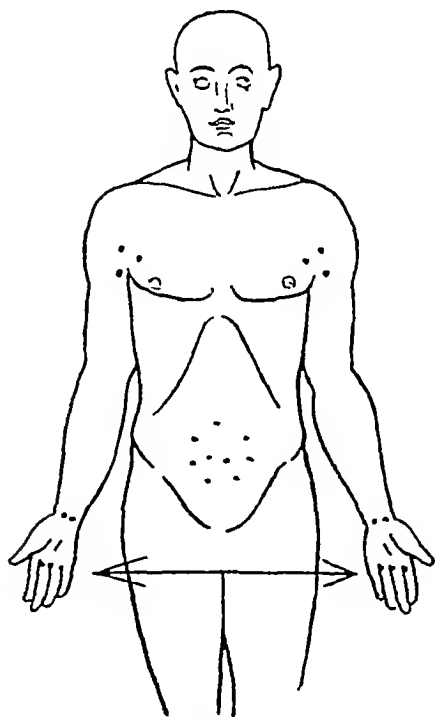


FIG 1

Distribution of primary scabies

ends of the fingers. Ankles and feet are sometimes similarly involved. By contrast, the back is relatively free, and the face is not affected, except rarely in infants. The observer should be prepared to find many gaps in this typical regional distribution. A detailed and complete examination is therefore required before a conclusion is reached. In the adult male, lesions on the penis (and scrotum) provide a valuable aid to diagnosis, just as the presence of burrows on the palms and soles of infants serves to clinch the diagnosis in an otherwise obscure eruption.

Scabies complicated by pyodermia—Impetiginous sores form on the lower buttocks, elbows and knees. Indeed a grouped impetigo on the lower buttocks can have only one interpretation and its paramount importance as an aid to diagnosis cannot be too strongly emphasized. It is often present and fully developed in adults both male and female when the eruption elsewhere is sparse and doubtful,

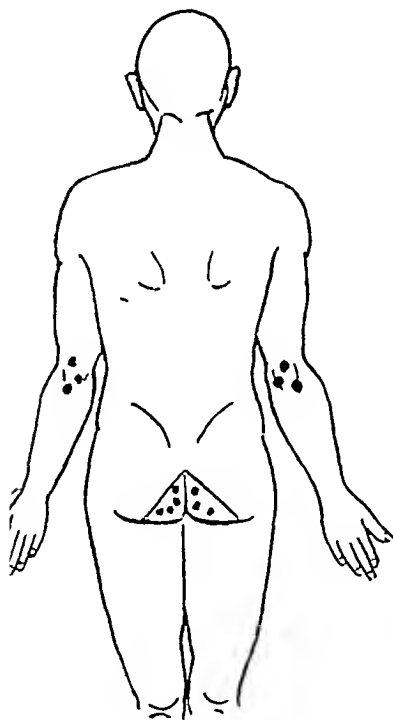


FIG 2
Distribution of secondary impetigo
in scabies

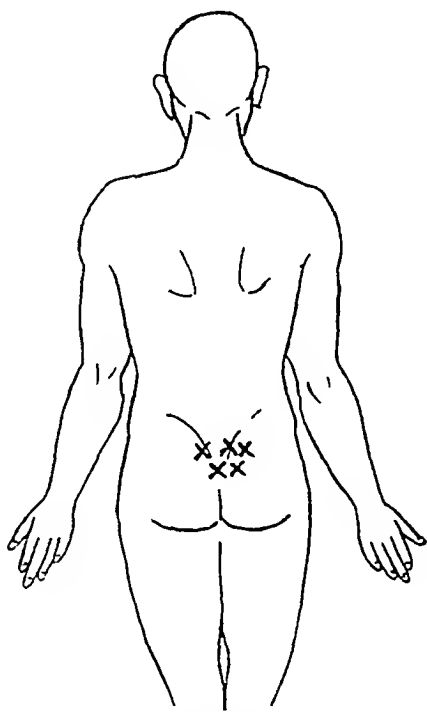


FIG 3
Lacerated back: distribution of secondary
impetigo in pediculosis

A simple and all-sufficient key to a difficult problem, which only needs looking for pediculosis: the *upper* buttocks (and lumbar regions) are similarly selected by impetigo. As the statement is sometimes made that scabies affects the buttocks without further qualification, attention is here called to this all-important distinction.

Scabies complicated by eczema or dermatitis—A potentially eczematous subject is able to develop slight or extensive eczema or dermatitis from the irritation

caused by the parasite, that is independently of any external application whatsoever, and these cases are usually and improperly classified by the careless observer as examples of sulphur dermatitis. Dermatitis is also met with when sulphur or some other sarcopticide has been used or abused, the results of under-treatment or over-treatment. In these cases the eruption is liable to be marked over friction areas—the shoulders and outer thighs and the waist—giving a hint of underlying parasitic disease which the alert scabies-minded practitioner will not miss.

Finally, in any of the above cases if a burrow can be found and a mite is removed for microscopic examination, this establishes the diagnosis beyond question. For those who may not be expert with the needle and lens the following alternative procedure is recommended—

The whole contents of the burrow are scraped out with a small curette, mixed on a slip with a drop of liquor potassæ, covered with a slip and examined under a $\frac{2}{3}$ objective. By this means the mite, or her eggs, or both are usually found easily.

DIFFERENTIAL DIAGNOSIS

Consideration should first be given to *industrial dermatitis*. Both scabies and many kinds of trade eczema affect the hands, but the first is usually polymorphic with the pathognomonic burrow, and the second is usually eczematous. Scabies has also its characteristic elements elsewhere. The consequences of a mistake are most unfortunate, because the workman is thereby prevented, perhaps for weeks, from working and earning wages.

Syphilis comes next in order, for it will be appreciated from what has been said above that when scabies has a venereal origin a scabid lesion on the penis developing some four weeks after sexual congress must at least possess the element of suspicion as to its nature. Scabies itches, syphilis does not, and there should be present elsewhere other manifestations of scabies. It is clearly possible to find both conditions represented at the same time, therefore it is prudent if any doubt exists to make all the necessary investigations, such as an examination for spirochæta and a series of Wassermann tests.

In *cheiropompholyx*, the third condition to be considered, the sago-grain vesicles on the hands and wrists are usually more deeply seated, more numerous and more difficult to rupture. Nevertheless, to exclude scabies may at times be far from easy.

Finally, *lichen urticatus*, the papular urticaria of young children, should be included in order that it may be excluded.

TREATMENT

Warfare has always been accompanied by epidemics of scabies, as Dr R. Friedman has so convincingly proved in his remarkable monograph on this subject. In the present war, scabies has followed this historic rule, the slight increase which preceded hostilities being suddenly converted into a formidable epidemic after 1939. The planners most courageously, and quite properly on the look-out for new methods of treatment, discarded such old-fashioned remedies as sulphur

ointment, and the like, for rotenone emulsion, derris root lotion, sulphur soap lather, and sprays of "hypo" and hydrochloric acid Mellanby testing out these different procedures showed that they were incompetent in varying degrees. His investigations gave pride of place to sulphur ointment and benzyl benzoate emulsion, each with an efficiency rate of approximately 100 per cent. Aladdin's old lamp had proved best after all.

The traditional treatment of scabies required three separate stages: first a warm soap bath in which the burrows were scrubbed open, secondly the application of the selected medicament all over below the neck upon an agreed number of occasions, and thirdly disinfection of contact day and night clothing, and bedding. The researches of Mellanby and his collaborators have thrown considerable doubt upon the necessity for the first and last stages, the assumption being that the parasitocides, and in particular benzyl benzoate emulsion, can penetrate and destroy both mites and ova on and in the skin, and disinfest clothing and bedding used after the application has been made to the patient's body.

From what has already been said it is clear that two sarcopticides have a sufficiently high efficiency index, viz. *sulphur ointment* in one of its various forms, and *benzyl benzoate*, both vintage stock for, although this is rarely mentioned, benzyl benzoate has been in use for some fifty years and was recommended for the treatment of scabies by both Radcliffe-Crocker and Malcolm Morris. Because ointment bases are in short supply and are hard upon clothing, benzyl benzoate emulsion containing 25 per cent. of the active principle, 2 per cent. lanette wax and water to 100 is standardized as a war-time measure. Unless the patient attends a scabies centre, treatment is usually more conveniently carried out at bedtime in the following manner:—

A preliminary bath is taken, after drying, the selected medicament is rubbed in or brushed all over the body below the neck, and the patient then gets into bed. If sulphur ointment (B.P.) is used it is applied on three consecutive nights, benzyl benzoate emulsion is, however, only used twice, either on two consecutive nights, or the second treatment being given one week after the first. Although there are conflicting views held, there can be no harm in washing and ironing contact garments and sheets and blankets. It will be noted that with both sulphur and benzyl benzoate a preliminary bath is taken, that the remedy is applied all over below the neck, and that some simple method of disinfection is recommended.

Both procedures are curative and should probably reach 100 per cent. under the best conditions. It is nevertheless true that in my special scabies clinic, where benzyl benzoate is exclusively employed, a recurrence rate of just over 2 per cent. has been observed, attributable, as it has seemed, to failure from time to time to treat the whole family unit. This gives point to the rule that all the members of the household should be treated, certainly in hospital practice, and the sleeping partner invariably, the mass attack being delivered at the same time for all, in order to avoid overlapping and reinfestation. Patients are often inclined to over-treat themselves, with no advantage, but thereby certainly increasing the risk of post-scabietic dermatitis. Renewed itching is a warning against further active remedies, and soap and water, and calls for rest and the application of simple ointments or creams.

Scabies complicated by eczema is a major dermatological problem. With care it is possible to work in three sulphur or two benzyl benzoate rubs, not as a consecutive series but at intervals, using, say, boracic-zinc ointment at all other times. For straight scabies in infants, whose tender skin demands special consideration, half-strength sulphur ointment is used following the three-day plan. And the practitioner will not forget the adult with whom the infant is associated. When *impetigo* is present, unless it is severe and extensive, it is usually best to treat the scab first and then the impetigo. The secondary infection responds readily to 1 per cent gentian violet paint, or 2 per cent ammoniated mercury and zinc paste, removal of crusts or scabs being called for when they prevent the remedy from reaching the underlying disease.

CONCLUSION

In this article I have dealt with scabies as met with in practice, not as a Public Health matter, for this is entirely beyond my competence. The patient either has or has not scabies and therefore it is best as clinicians to keep to this simple rule, believing that by early diagnosis and early treatment the epidemic will eventually be suppressed.

The "doctor-patient" relationship requires the practitioner to select for each patient a method of treatment calculated to give the highest cure rate. This may differ from the Public Health procedure when a community is under consideration and a variety of complicating circumstances call for a mass attack rather than individual attention. Nevertheless, in all cases, that is, both in public and private practice, treatment is far more likely to succeed and to cure if a trained nurse orderly supervises and assists in the routine procedure, because even the most intelligent patients—and scabies is no respecter of persons, attacking the mentally alert and the cleanly or the dirty—are apt to forget or misunderstand verbal instructions given at the consultation at a time when the mind is not in its most receptive mood. For this reason written or printed instructions with exact directions are always well worth while.

Finally, if it is always remembered that scabies is at the present time a common disease, and if a constant watch is kept for it, even in unexpected quarters, it is unlikely that it will be missed or overlooked.

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THE CAUSES AND TREATMENT OF ACUTE DERMATITIS

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AT the outset I feel that I ought to define my subject, and at the same time plainly that I propose to be rather dogmatic in my statements, and to describe the methods which I have found most useful, without attempting to disentangle the small part which is original from the large part which is borrowed from many sources.

CAUSAL FACTORS

Irritants and hypersensitivity—Dermatitis may be defined as the reaction of the skin to an irritant, and the irritant may reach the skin from without or from within. The external route is the more frequent, but even gross chemical irritants—such as salvarsan is an example—may reach the skin from within, and more subtle chemical substances, perhaps manufactured inside the patient's body, may produce that form of dermatitis which is called eczema. There are some substances, such as mustard-gas, for instance—which will provoke dermatitis in most persons, but the majority of cases of dermatitis encountered in practice the exciting cause is a substance which most skins can tolerate, but towards which the patient's skin is abnormally sensitive. And here it must be emphasized that in classifying skins as "sensitive" or "insensitive," and substances as "irritant" or "non-irritant," there are no water-tight compartments, but all intermediate grades can be found. It is generally recognized, however, that some people are much more likely than others to become supersensitive towards one or more substances, and such individuals are commonly referred to as belonging to the "sensitizable class." Hypersensitivity towards a substance may possibly be inborn, but it is most often acquired. What is inborn, and often inherited, is the liability to become sensitized. Hence the importance of family history in the prognosis of eczema. How, then, is supersensitivity acquired? Long-continued exposure, exposure to a high concentration, exposure to the usual concentration after some previous damage to the skin—all these are possible ways. Often a slight dermatitis is set up by one of these ways, attracts little attention and soon heals, but when the patient again meets the irritant a much more severe dermatitis results. Supersensitivity is usually highly specific, and tends to last for long periods, often probably for life. Frequently the skin on parts unaffected by dermatitis is no more sensitive towards the general run of irritants than is that of normal controls, but in other cases, particularly those described as "eczema," there may be a general irritability of the skin.

Allergy—"Eczema" has already been defined as that form of dermatitis which we believe to be caused by subtle, biochemical substances, elaborated inside the patient's body, and reaching the skin from within, and often the irritant is manufactured in inflamed or otherwise damaged skin, as by burning or abrasion. On this view, eczema frequently arises out of an originally localized "contact" dermatitis, and every fresh patch of eczema is a fresh manufactory of the allergen, so that the disease, in popular phraseology, "feeds on itself." In other cases, the patient has become supersensitive towards micro-organisms, their toxins, or possibly products of their interaction with the tissues. Streptococci and hyphomycetes are the most common offenders, but in a few formidable cases it has been possible to demonstrate allergy to *Staphylococcus aureus*. The acute bullous dermatitis of the hands (sometimes also the feet) which is called cheiropompholyx is certainly sometimes caused by allergy towards epidermophyton, probably sometimes towards pyogenic cocci, and perhaps sometimes towards an autogenous allergen. The last is hard to prove, but it does seem in some cases that a substance accumulates in the system, and when it reaches a certain "head" the eruption occurs. That food proteins may excite eczema is widely held, but again I have no evidence that they ever do, although they may at times aggravate an existing eczema.

Broadly speaking, acute dermatitis from the action of an external irritant will be confined to the areas which have been directly exposed to it, conversely, if the eruption affects parts which presumably were not so exposed, then internal factors, playing at least a part in the causation, should be suspected. Often in such cases a carefully taken history will reveal a local origin for the condition.

IRRITANTS

It would be a colossal task to catalogue all the agents which have been incriminated as causes of acute dermatitis, and even in the larger textbooks the lists are far from exhaustive. It is, in fact, a sound assumption that there are few substances in Nature which are completely incapable of causing dermatitis. Among the most acute cases are those caused by certain plants. Primulas, particularly obconica, and the Rhus tribe, particularly the American poison ivy, are the best known. A recent American book lists 113 plants, and 106 trees, which have been recorded as causes, and these lists are to my own knowledge not exhaustive. Incidentally, plant dermatitis seems to be much more frequent in North America than in Britain, perhaps because the population there is largely derived from stocks which have not been in contact with the indigenous flora for more than a few generations at most. None the less, cases due to chrysanthemum, pyrethrum, geranium, bulb plants, and such weeds as milfoil, are occasionally seen in this country. With some plants, such as wild parsley, subsequent exposure to sunlight is necessary for the production of dermatitis.

Dyes, drugs and cosmetics also may cause dermatitis of the most acute type. Paraphenylenediamine, which continues to be used for dyeing furs, and also for human hair, and occasionally eyebrows and lashes, and moustaches, because by varying the degree of oxidation it is possible to get a wide range of tints, is a very

powerful sensitizing agent, and the dermatitis set up by it may not only be severe locally but may spread all over the body, and may last for months. Many other dyes may cause dermatitis, but acute dermatitis from them is not so common.

Supersensitiveness to drugs, whether these are used as topical applications, or reach the skin only incidentally, is frequent. Resorcin, mercurials, carbolic acid and all the coal tar antiseptics, salicylic acid, sulphur, iodoform, iodine itself, *chrysarobin*, *dioxyanthranol*, the *sulphonamides*—these are only a selection from a long list. I have seen acute dermatitis of the genitalia from the use of a contraceptive preparation containing mercury, and afterwards in the same subject an equally acute dermatitis from a white precipitate ointment, used for impetigo of the face. Atropine to the eyes, and benzedrine in a nasal spray may produce severe local dermatitis. The organic arsenicals given by injection may cause the most formidable general dermatitis, as may gold compounds, and rarely bismuth. Drugs by the mouth, particularly some of the barbiturates, may act similarly, although fortunately not often. Liniments and counter-irritants are common offenders.

Cosmetics are an important group. Hair dyes have been mentioned, and I would only add that most of them contain paraphenylenediamine, no matter the name under which they masquerade. With face powders the orris root, the colouring matter or the perfume may be to blame. I have seen a patient exquisitely sensitive to powder of a well-known brand, of a certain colour and perfume, and tolerant of the same brand and tint, but with a different perfume. In lipstick the dyes, particularly eosin, are responsible. With nail varnish sometimes the fingers are tolerant, but the face is affected where the fingers have touched it. Depilatories on face or axillæ, anti-perspiration lotions on axillæ, "liquid stockings" on legs—all these give occasional trouble.

INDUSTRIAL DERMATITIS

It may have been noticed that so far no mention has been made of occupational dermatitis. The reason is, of course, that this is comparatively seldom acute. Cement and other lime compounds, paints, oils, chrome, alkalis, explosives, tanning compounds, French-polishing and leather-finishing fluids, "improvers" in flour, and a great army of other substances cause commonly subacute or chronic dermatitis, but an occasional acute case from one of them does crop up. Fairly acute dermatitis is seen in groups of dock labourers from soda-ash, and from the dust of copra, which proved to be a mass of mites and small beetles, alive, and in various stages of disintegration. Hard woods, much used by shipyard carpenters, may at times cause acute dermatitis. To conclude this necessarily incomplete survey, such curious causes as nickel, used in suspender-fasteners or wrist-watches, and modern plastics, used for spectacle-frames, may be mentioned.

DIAGNOSIS

The determination of the cause of an acute dermatitis is obviously of the highest importance, and precise history taking is the first essential. Close cross-examination

of the patient may reveal what he does not volunteer, but quite often nothing suggestive can be elicited, and in that event there is nothing to be done but wait and see if there is a recurrence. If there is no recurrence, and the cause of the single attack remains shrouded in mystery, that is no great matter for worry. If there are recurrences, then there are opportunities for detective work.

Patch tests—If even slight suspicion falls upon some substance, patch tests should be done. The technique has often been described, and is probably familiar to most readers, but it is well to give it briefly here.—

With most soluble substances, a 1 per cent watery solution should be made, a piece of well washed linen, not larger than a postage stamp soaked in it, applied to the skin at a point well away from the areas of dermatitis, covered with rubber sheeting, and kept on by means of plaster or a bandage. With substances known to be very irritant, higher dilutions should be used. Only bodies can be used undiluted, and covered in with grease-proof paper. Solids, such as nickel, can be applied directly, and kept on with plaster. For furs and textiles, take a snippet from inside, wet it well, apply, and cover with rubber sheeting. Leaves and petals of plants can be applied directly, under plaster. In every case controls should be done, using other substances or plants. When a number of substances have been tested, they will act as controls for each other. Inspect the sites every twelve hours up to forty-eight hours, and remove the patch at the first sign of a positive reaction. The reaction should be papulo-vesicular, not just erythematous, and the controls should be negative.

These tests are not entirely free from possible fallacy, but they are sufficiently reliable for practical purposes, and they are sometimes extraordinarily specific, as in the case of a midwife who correctly attributed the dermatitis of her hand to lysol. She reacted positively to the brand which she had been using, but not to either of two other brands, and she was able to avoid further trouble simply by changing her brand.

TREATMENT

General—In all but mild cases, rest in bed is one of the most valuable measures. It acts in a number of ways—by withdrawing, in all probability, the patient from further contact with the causal irritant, by lowering the metabolic rate generally by making possible “messy” treatments which would be prohibitive with the patient up and about, and by avoiding sudden changes of temperature. This last is a point of real importance. The skin is, of course, one of the two main heat-regulating organs of the body, and when its function is impaired, the body cannot easily adjust itself to changes of temperature. A bedroom may be kept warm by day and allowed to cool at night, but the change is gradual, whereas the change on going from room to room may be abrupt. For this same reason care should be taken when using cooling applications to see that they do not cool to excess. Going to bed has often a good psychological effect. The feeling of having got down to it, and of being for the moment out of affairs, has a soothing effect, and conduces to cure.

As regards *diet*, alcohol, spices and condiments should be avoided, and tea and coffee taken neither very hot nor very strong, if at all, but otherwise I am sceptical of the importance of dieting. Considerable amounts of fluid should be given, and freshly-infused tea, not too hot, is as good a means as any to this end. I have tried salt-poor diets, but am unconvinced of their value. In many really acute

CARCINOMA OF THE ŒSOPHAGUS

In a discussion at the Royal Society of Medicine on the treatment of carcinoma of the œsophagus, Taylor (1944) described a method of excising a carcinoma of the œsophagus, with anastomosis of the ends, by freeing the stomach and drawing it up outside the thorax. Other speakers gave the results they had obtained either by direct anastomosis, or by the formation of skin tubes to replace the missing portion. On the whole it seemed that the method of direct anastomosis had advantages. Some of the speakers had had good results from the insertion of radon seeds directly into the growth through an œsophagoscope, or around it after the œsophagus had been exposed by operation. The radium bougie has proved disappointing. In carefully selected cases Levitt obtained "remarkable palliation" by a special method of deep X-ray therapy, but he gave a serious warning against the use of the method in unsuitable cases, patients with substernal pain or persistent tachycardia were made far worse by the treatment. The best hope for patients with carcinoma of the œsophagus seems to be in the improvement of surgical technique, a definite advance has been made in the operative treatment of these cases, and other methods are still disappointing. At the same time it is clear that in many cases deep X-ray therapy has given real relief to the patient, and it is to be hoped that here too improved technique will in time give still better results. It is already suggested that intra-œsophageal burying of radon seeds is preferable to gastrostomy from the point of view of the patient's comfort.

REFERRED PAIN IN OTOLARYNGOLOGY

This is a frequent difficulty in diagnosis. The most usual example is pain referred to the ear from a carious lower molar, or sometimes an unerupted wisdom tooth pressing on the next molar. Occasionally a minute area of decay causes quite disproportionate pain in the ear. Tonsillitis and quinsy often cause aural pain, and the "stab in the ear" on swallowing is a well-known symptom after tonsillectomy, a distended tonsillar crypt may be a cause without any other evidence of sore throat. Some cases of aural pain with no aural disease are due to ulceration in the pharynx, larynx or nasopharynx. Gummatous ulceration in these regions is so rare now that there is danger of the possibility being overlooked, but it still is occasionally seen. Carcinoma, especially of the pyriform fossa, and tuberculous ulceration of the larynx, are possibilities which must always be kept in mind. Ulceration in the nasopharynx, either gumma or new growth, is much less common. Sinus suppuration, especially of the sphenoid, is said to cause aural pain, but this must be rare.

Headache from sinus suppuration is well recognized, but other headache of nasal origin, e.g., septal deflections, although it certainly exists, is not common. In a suspected case, every other possible cause must be eliminated before any nasal operation is considered. Far too many patients with migraine in some unusual form, or with "vascular headache," have had unnecessary nasal operations performed.

In a discussion at the Royal Society of Medicine on "Pain in Laryngology" (1943) many interesting and unusual causes of referred pain were described —

Mollison's aphorism "A lump in the neck and a piece of wool in the ear is diagnostic of growth in the deep pharynx" is worth remembering. Wilson remarked that occasionally patients with intrinsic laryngeal carcinoma had pain in the ear, without any perichondritis spread to the pharyngeal wall. Another unusual case was described in which a patient had a pain at the tip of the nose, severe enough to keep him awake at night, there was nothing wrong with the nose, but there was a small dental cyst at the apex of the central incisor. Removal of the cyst instantly cured the pain in the nose. A curious point, mentioned by Cann, has never been satisfactorily explained. It is common to get pain referred to the ear from other areas supplied by the glossopharyngeal nerve, but ear troubles do not cause pain in the throat.

Other causes of pain in the head and face are fibrositis of the neck muscles, and arthritis of the temporo-mandibular joint. Sometimes tonsillitis with inflammation of the cervical glands causes acute tenderness of the skin over the mastoid. This may be so severe as to raise a suspicion of mastoiditis, but the normal drum and intact hearing give the correct diagnosis.

BLAST INJURIES

At the present time blast injuries to the ears are of great importance. This subject has been discussed by Otty (1941), but some of the lessons have not been fully learnt. It is still necessary to emphasize the rule that an ear, damaged by blast or other injury, must not be syringed. The most that must be done as "first aid" is to clean the pinna—not the meatus—with biniodide in spirit and cover it with a sterile pad. A useful precaution against rupture of the drum is to open the mouth a little as the bomb falls, and thus equalize the pressure between the external air pressing on the drum and the air in the Eustachian tube and middle ear. Josephine Collier (1940-41) noticed that in Barcelona ruptured drums were much more common in men than in women, she suggested that this was due to the fact that the women were much more in the habit of screaming when the bombs fell.

THE INFLUENCE OF VITAMINS AND HORMONES IN THROAT AND EAR CONDITIONS

The influence of vitamins is still the subject of research. Too much reliance must not be placed on animal experiments in which a high degree of vitamin deficiency is produced, such extensive vitamin shortage is seldom seen in ordinary practice. Mellanby (1943), for instance, has pointed out that in earlier experiments on vitamin A it was found that rats suffering from deficiency regularly developed otitis media, but later work showed that this was a peculiarity of rats, which are the only animals to suffer in this way. When vitamins A and D were finally differentiated it was found that animals starved of the former showed degeneration of the cochlear and vestibular nerves, as well as of other cranial nerves, due to the pressure of bony overgrowth on the nerve. It was not vitamin D deficiency, because additional calcium, although it made the bone more compact, did not arrest the overgrowth.

At first sight this seems to offer encouragement for the treatment of otosclerosis. Unfortunately, both in its distribution and its structure, the bone laid down in a vitamin A deficiency is quite unlike the abnormal bone in otosclerosis. Greene (1943) has pointed out that there is no evidence of any endocrine deficiency in otosclerosis—"there is an unfortunate prevalence of uncontrolled observation and therapeutic optimism." As instances he quoted the claim that otosclerosis is due to hyperparathyroidism, and the opposing claim that the cause is parathyroid deficiency, neither is supported by evidence. It is said that otosclerosis has been improved by parathyroid given by mouth, and it is known that parathyroid given by mouth is entirely inactive. The possible effect of pituitary changes must be considered. Nerve deafness in young people is so frequently found in association with calvarial sclerosis that there may be a causal connexion. The influence of vitamin deficiency on the pituitary may fit in with the changes described by Mellanby.

The relation between the nasal mucosa and the sex mechanism has often been noticed—as far back as Hippocrates—and attempts have been made to relieve atrophic rhinitis by oestrogen treatment. In some cases this has undoubtedly succeeded, but it is only palliative, and the patients relapse if the treatment is stopped. This cannot be due to improvement of the ciliary action, as this is increased by small doses of oestrogen but diminished by larger doses, whereas in atrophic rhinitis the larger doses are more effective. The amelioration must be due to the vasodilator effect of oestrogen, which would improve the blood supply to the mucosa.

Macbeth (1943) found in a series of tonsil cases an abnormally high percentage of post-operative hæmorrhage; he found in these cases a low blood level of ascorbic acid. A pre-operative course of ascorbic acid (1,000 mgm daily for four days) was tried on one series of cases, and in this series the bleeding was less at operation. There was no post-operative hæmorrhage and the period of recovery was markedly shorter than in an exactly similar series of cases in which ascorbic acid was not given. He believes that there is a winter and spring ascorbic acid shortage in Service and civilian cases, and that this shortage is associated with an increased tendency to upper respiratory infections and bleeding.

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OPHTHALMOLOGY

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Assessment of the value of variations in technique and of the acquisition of new diagnostic agents is an extremely difficult matter calling for the exercise of judgment with impartiality and thoroughness. He is bold who would claim that such and such a change in any branch of medical science, however small, represents an advance, only too often have new methods and new drugs been thus hailed, later to be proved, by patient trial and accumulated experience, of far less value than their supporters ascribed, or even of no value at all, as it may be impossible to determine by observing only a small portion of a wide and turbulent stream exactly in which direction the tide or current is running, so it may be difficult to decide by the observation of an isolated case, or a single treatment, whether or no such a change truly constitutes an advance. The broad stream of progress has to be viewed, and the new method of treatment judged with due consideration of its value as a pointer to the future. It is by no means difficult to find examples of such in ophthalmology. The introduction of a new drug or new method attracts the inevitable band of enthusiasts who are willing to assess the value of these innovations and publish their opinions, with deductions so frequently drawn from uncontrolled experiments and a consideration of totally inadequate numbers. A further surprising fact is that which so many clinicians appear to be willing to place upon a new method, without much thought as to the necessity for a change, or much care for the assessment of its value. It is thus that relatively or absolutely valueless innovations acquire spurious popularity and survive solely upon a basis of custom and tradition.

CHEMOTHERAPY

Introduction—Such a welcome has been given to the sulphonamide group of drugs in general medicine and in the specialty under consideration. These drugs have found their rightful place in general medicine, though in the early stages of their use it was difficult to find a bed-board in a general hospital ward which did not bear prominently on its column the name of one of the sulphonamide drugs. The settling of their place is somewhat longer in ophthalmic circles, though the deplorable routine treatment of a "red eye" by these drugs certainly shows the need for a change. The soluble sodium sulphacetamide, marketed as albucid, is used in 10 per cent or 30 per cent solution, as a local antiseptic drop, and is used in varying degrees from a mild conjunctivitis to a serious corneal ulcer with little or no effect. I have yet to be convinced that the arrival of this drug represents an advance in treatment, for I have had no reason to conclude that it is more than an external therapeutic agent than many in use before its adoption. I have not seen any great benefit result from the use of the sulphonamides taken

internally in conditions such as acute iritis or iridocyclitis. They have value, however, in the treatment of general intra-ocular infections, such as endophthalmitis, especially in those of a low-grade subacute type. It is not surprising that disappointing results have been reported from their use in cases of choroiditis, especially the focal type frequently occurring in adolescents, usually female, since the infective nature of the majority of these cases is by no means proven. Much further clinical research is necessary before the proper place of these drugs in ophthalmic treatment can be finally assessed, their value, however, in the treatment of ophthalmia neonatorum may be taken as proven.

A more fruitful field has been opened up for the ophthalmologist by the introduction of *penicillin*, although the limited supply for civilian use has prevented widespread investigation. None the less, enough has been done to make it appear that a valuable agent has been introduced. In a recent private communication most hopeful statements appear with regard to the treatment of blepharitis and conjunctivitis by a solution or ointment containing this drug. Chronic blepharitis is often a most resistant disease, and a reliable remedy would prove a great boon. Although the number of cases is not large, the figures quoted indicate that penicillin possesses curative properties far exceeding those of the drugs in common use in these superficial infective conditions, which are most unsightly and a source of great discomfort to the sufferers. It will be interesting to note if the good results obtained prove to be permanent, since relapse is a common characteristic in these conditions. It would seem likely that penicillin will prove to be of far greater value than the sulphonamides in the treatment of external conditions of the eye.

OPHTHALMIC SURGERY

Bomb injuries—The advent of the heavy high-explosive anti-personnel bomb has increased enormously the incidence of civilian ocular injuries, mainly by the agency of flying glass fragments. All grades of injury are met with, from superficial corneal and conjunctival foreign bodies, usually multiple, to severe and mutilating incised wounds demanding immediate removal of the globe. In the case of perforating wounds of the cornea with prolapse of iris, though the more usual method of excision of the prolapse and temporary protection of the wound by closure with a conjunctival flap is still widely adopted, in some circles there is a preference for suture of the wound. The advantages are closer and more accurate apposition of the edges of the wound, the disadvantage lies mainly in the amount of manipulation involved. More especially in the case of injuries involving loss of vitreous, any but the absolute minimum of manipulation should be rigorously avoided for fear of causing further loss. Moreover, in corneal wounds, the question of sutures raises the larger general question of the advisability of introducing sutures into an avascular tissue, except when quite unavoidable, for the procedure is fraught with the danger of local infiltration, with possible permanent loss of transparency and even actual ulceration and sloughing. The fine "Maddox" needle is a most useful one when suturing is decided upon, and the cycless combined needle-suture also enable the operation to be carried out with great delicacy.

A point perhaps not generally recognized, which has emerged from the experience in the treatment of the mass of material unfortunately presented in recent times, is the

h of time which may be allowed to elapse between reception of an ocular injury and its surgical repair without imperilling the result. In many cases of orbital injury the general condition of the patient forbids immediate interference, therefore, immediate general surgery is often imperative and is undertaken before an ophthalmic specialist is called. In either situation, especially as the use of general anaesthesia is becoming more common when operating for any but the most trivial type of eye injury, a considerable interval may elapse before operation is undertaken. Although it must be admitted that, until knowledge of the pathology of sympathetic ophthalmia is far more complete than at present, it is impossible to dogmatically state that the possibility of its occurrence is not increased by such delay, no evidence has so far come to light that a reasonable interval between injury and reparative operation does so increase it. Further, it is certainly true that an interval of some hours or even longer appears to have no adverse effect on the immediate or remote result of the surgical treatment of ocular injuries. On the contrary, it may well be the case that the improved general condition of the patient, resulting from a recovery interval, exercises a beneficial local effect in the case of severe surgical shock complicating injury to the eye.

the intra-ocular foreign body—To those ophthalmologists whose practice does not lie in an industrial area, the war has brought an increase in the number of cases of intra-ocular foreign body. Much of the steel used in modern missiles is non-magnetic, which fact increases the surgical difficulties.

It is interesting to recall the case of two soldiers who received facial injuries from the same bomb on the Normandy beaches, and were carried off as casualties. By a strange coincidence they found themselves in adjacent beds in Moorfields, having arrived by different and devious routes. Each had an intra-ocular foreign body, one magnetic, the other non-magnetic.

The removal of a magnetic intra-ocular foreign body by the magnet is a procedure which causes little upset to the eye, and the prognosis may be said to depend upon the amount of damage caused by the injury. In the case of non-magnetic metal, glass, or other inorganic debris, the problem is much more difficult, and the local interference may cause further unavoidable and serious damage to the eye. The recent Hunterian lecture has given further proof that intra-ocular surgery for the removal of a contained non-magnetic foreign body may be undertaken with success, but there is no doubt that the prognosis is much worse than in the case of a magnetic foreign body. Indeed, except in cases presenting particularly useful features, which demand expert knowledge for their recognition, it is true to say that the majority of non-magnetic foreign bodies in the posterior segment are best left alone, in the hope that they will remain there inert and harmless. The danger of siderosis from an iron foreign body, however, is always present, and when the latter is non-magnetic the surgical problem presented is often a difficult one.

nucleation—On many occasions since the outbreak of war I have been asked by general surgeons for some criteria for determining whether an eye is injured and the hope of recovery. The question is a difficult one to answer in a manner which will cover all possibilities, and undue ruthlessness results in the excision of eyes which might have remained useful, or at worst harmless and cosmetically tolerable, whereas ill-advised conservatism may condemn a patient to a

prolonged period of treatment, resulting in the retention of a useless eye, at worst unsightly or a source of danger to its fellow. Between these two extremes the ideal course lies, but the advice is deliberately given, that in cases of doubt the wisest course in present circumstances is to enucleate, on the grounds that the unnecessary loss of a few single eyes is preferable to the endangering of pairs of eyes. The operative phrase in the above sentence is "in present circumstances", these are such that the surgeon is often prevented from regular and frequent attendance upon an eye casualty, and only too often, in the London area, after the first attention the patient is "evacuated" and comes under the care of another surgeon, possibly not to be seen again by the original surgeon until weeks or months have elapsed, or even not at all. In cases which have merited an attempt at surgical repair but in which the injury is such that the restoration of a high degree of visual acuity is unlikely, a good general rule is to excise if, at the end of two weeks after injury, the eye is not rapidly whitening and showing signs of being well on the way to becoming a quiet eye. As to the original question, the non-specialist should never excise if no perforation is obvious, since such an eye though it may be painful and have a sinister appearance, will not be a dangerous eye. Perforations behind the limbus are far more liable to cause sight-destroying complications than those in front of it, loss of vitreous is always of serious significance, and, generally speaking, the larger the wound the more doubtful the prognosis. It has been said that, in the absence of an ophthalmic surgeon, an eye which is soft should be excised, but such is by no means the case, since it is true that although there are admittedly degrees of softness any eye which has suffered a perforating injury, however trivial, is soft, unless sufficient time has elapsed for the lips of the wound to become adherent and for the intra-ocular pressure to be restored wholly or partly by retention of the reformed aqueous humour. Moreover, it is inadvisable to investigate, by digital palpation, the tension of an injured eye, since if prolapse of intra-ocular contents has occurred the manipulation is liable to cause further loss. The expert often has the greatest difficulty in deciding whether or not an injured eye is hopeless, and all surgeons of any experience have seen these prognostications (expressed or reserved!) refuted by the recovery of an apparently hopeless eye or the loss of one in which the injury appeared relatively trivial. It is therefore difficult to formulate a golden rule for the non-expert, for application to the problem under consideration. Perhaps the problem might be summed up thus—in the absence of complete and obvious disorganization of an eye, conservation for two weeks is invariably safe and the responsibility can always be passed on to the expert in that period. There are two considerations, however, which take a little of the gilt off this rule, one is that the earlier the expert sees the eye the better, and the other is that the patient may be subjected to anaesthesia and operation twice instead of getting his surgical troubles over on one occasion.

ANÆSTHESIA

The use of *pentothal* in ophthalmic surgery is a definite advance. To have the patient lifted quite free of any anæsthetic apparatus (other than an airway) is an enormous advantage, and most ophthalmic operations can be comfortably completed in this

time which an expert can safely offer with pentothal anæsthesia. The tendency is to use a general anæsthetic much more frequently than has been common hitherto, especially in cases in which the cooperation of the patient is not essential.

VITAMINS

No striking advance in the therapeutic use of vitamins in ophthalmology has been made in the last twelve months, nor does it seem likely that such will be made until present conditions give place to a more leisurely and contemplative atmosphere. The situation has changed little, individual ophthalmologists continue to use vitamins in a somewhat empirical manner, and the results are just what would be expected from such a form of trial. Considerable clinical research is necessary in this field, and would yield valuable results, but at present few dogmatic statements can safely be made on the subject. From recent writings it would appear that even the ophthalmic manifestations of ariboflavinosis, which have been described in detail by more than one observer, are not so definite as was anticipated. The use of vitamin C in the treatment of superficial corneal conditions promises well but must be considered to be still in the experimental stage.

PHYSIOTHERAPY

The situation in the field of the application of physiotherapeutic agents in ophthalmology has become stabilized. When a patient's general condition is wholly or partly responsible for his local disease—of which the best example is given by phlyctenular ophthalmia—general *ultra-violet light* baths are of proved value and should be given in all cases, except when active lesions in the lungs forbid their use. The local treatment of the eye by ultra-violet light is far less popular than it was soon after its general inception some fifteen years ago. As physiotherapist to Moorfields, I notice that it is rare for my colleagues to refer a case for local therapy, whereas ten years ago there were always a few cases under treatment. This represents a swing of the pendulum which may have arisen from disappointment at results obtained. None the less there are superficial conditions which respond well to local therapy, probably better than to any other form of treatment, noticeably any form of persistent loss of corneal surface, such as recurrent erosion.

Diathermy has established itself as an indispensable form of ophthalmic therapy, apart from its use in the surgery of detached retina. It is generally accepted now that the most efficient form is the ultra-short wave, and it is most conveniently given by a Rototherm machine, using a cable electrode. Practically any kind of intra-ocular inflammation is helped by the application of diathermy, it finds its greatest use in glaucoma, choroiditis, and post-operative reactionary endophthalmitis. So much better is the effect of diathermy than that of the other forms of heat application that there is cause to wonder whether the thermal effect represents the whole story, or whether some hitherto uninvestigated electrical effect on living cells and tissues is not also operative. This and many other problems await investigation. War conditions, though they may provide opportunity for dramatic advances in other fields, do not do so in the field of ophthalmology. The problems presented—and they are many—require quiet investigation and patient research for their elucidation, and the destructive preoccupations of to-day do not provide a background for the contemplative occupations of clinical

THE PRESENT POSITION OF ANÆSTHESIA

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IN spite of the discovery of many new drugs and the development of many new anæsthetic techniques, mortality statistics remain unsatisfactory. In 1921 there were 347 deaths reported to the coroner; in 1931, 723, in 1941, 835. It will be shown that all modern anæsthetic agents have their special value, their dangers and disadvantages, that it is the man and not the machine or the method of administration which is of primary importance.

ETHER

Ether remains pre-eminently the best anæsthetic, and at the Wellhouse Hospital Barnet, the value of the *Oxford vaporizer* for anæsthetizing casualties and gravely ill patients is much appreciated. In this machine air is drawn over ether which is kept at a constant temperature by being surrounded by a mixture of solid and liquid calcium chloride. An absolutely constant percentage of ether-air is obtained with perfect vaporization. For endotracheal anæsthesia the tube should be of sufficient bore, and an airtight fit obtained by packing paraffin-soaked gauze round the tube where it enters the larynx. Ether from the *Oxford vaporizer* has been found valuable in hot climates.

Some anæsthetists attribute vomiting and chest complications to the use of ether, but vomiting is not confined to patients who have had ether anæsthesia, and it can be reduced by the administration of syntropan (Roche). Chest complications have nothing to do with the use of ether, but are usually associated with the type of operation performed. Military anæsthetists have shown how great a part cigarette smoking plays in the production of post-operative coughs which, however, are often less frequent after ether than after regional or spinal anæsthesia. The post-operative history of 2,094 soldiers was studied and it was found that if infection was present before operation, chest complications were not greater after ether than after cyclopropane.

Paul Campiche, taking absence of fatalities and possibility of resuscitation as a guide, considers ether twice as safe as the intravenous barbiturates and much safer than spinal anæsthetics. In a study of major operations on patients over seventy years of age, 27 patients being given ether and 28 infiltration anæsthesia, there were two cases of chest complications after ether, and five after infiltration anæsthesia. In another series consisting of patients of all ages, post-operative chest complications were found to occur under ether in 13.5 per cent of the cases, cyclopropane 17.5 per cent, spinal anæsthetics 39.5 per cent, when pre-operative chest troubles existed.

For the surgery of warfare, ether has not been found to be obsolete in the U.S.A. medical services. After Pearl Harbour, it was the consensus of all civilian practitioners that open drop ether still remains the primary choice, notwithstanding the variety and severity of casualties. It is regrettable to see a tendency to-day to discard inhalation anæsthesia, in spite of its known safety and suitability, and

not more dramatic and spectacular techniques which confer no real advantage either patient or surgeon. In a recent exhaustive report published in *Anæsthesiology*, March 1944, Gillespie notes that "the inhalation methods are less conducive to fatal accidents than others."

VINESTHENE

Vinesthene is a powerful anæsthetic, non-irritating, pleasant to inhale and has little after-effect. The death of a forty-one year old patient from acute yellow atrophy of the liver, four days after a hernia operation, under vinesthene, and two other deaths with necrosis of the liver have been reported. Convulsions have been known to occur in children some time after vinesthene has been administered.

In an investigation as to the chance of recovery after respiration had ceased and artificial respiration was instituted (in dogs), vinesthene was found particularly satisfactory.—

Drug	Number of cases of respiratory arrest	Failure to resuscitate
Ether	135	2
Vinesthene	43	0
Chloroform	106	10

A safety index was proposed as —

Ether	96.0
Vinesthene	100.0
Chloroform	9.5

The fall in blood pressure during vinesthene anæsthesia is found to be about 15 per cent.

Vinesthene can be given by the open drop method but it is better to use the Harris, or some similar, dripper. There are no cardiac irregularities, only slight salivation (after atropine), and post-anæsthetic vomiting is noticeably absent. Vinesthene anæsthetic mixture consists of 25 per cent vinesthene and 75 per cent ether, and is stable and satisfactory. Vinesthene has little effect on the uterine muscle, so that the mixture is extremely valuable in operative midwifery. Vinesthene would appear to be greatly superior to cyclopropane as regards safety, absence of after-effects, and the muscular relaxation obtainable.

TRILENE

A purified preparation of trichlorethylene, known as trilene (ICI), was introduced by Hewer and Hadfield. Full muscular relaxation is not readily obtained, cardiac irregularities have been reported, and delayed recovery occasionally takes place. Added to nitrous oxide-oxygen for dental operations it has been found satisfactory, there is no danger of laryngeal spasm, a high degree of oxygen can be given, and the most resistant patient subdued. Blood pressure changes are negligible and capillary oozing is less than with ether.

Convulsions have been noted, but these ceased spontaneously. One important warning is necessary: *trilene must not be used in a closed circuit system*, as cases of cranial nerve palsies and of deaths ascribed to poisonous substances produced by the interaction of trilene and the soda lime of a carbon dioxide absorber have been reported. Disturbances of the cardiac rhythm and rapid breathing have been noticed. The latter complication is abolished by changing to another anæsthetic, and it seldom occurs if the plane of anæsthesia is light.

Trilene has remarkable analgesic properties and a limited number of wo

were given trilene analgesia for the pains of labour at Wellhouse Hospital. Gr relief was obtained, no harm came to either mother or baby, and there was delay in labour if overdosage was avoided. Far more work has yet to be done before any opinion can be expressed as to the suitability of this analgesia for use by midwives.

CYCLOPROPANE

The introduction of cyclopropane marked an important epoch in the development of anaesthesia, but certain disadvantages associated with this anaesthetic have become apparent. It has been stated that no one, who has used cyclopropane for any number of cases, has failed to have at least one case in which the patient appeared to be in a serious state at some time during the anaesthetization. In one series of cases one death occurred and 50 per cent of patients gave insufficient relaxation, whilst in another series massive collapse of the lung was reported in one case. Such a misadventure was not observed in a personal series of 5,000 cases, although instances of respiratory depression and acute pulmonary oedema were met with.

Erythema and other examples of allergic reaction to the anaesthetic have been reported, but the addition of helium to the anaesthetic mixture is thought to assist in avoiding difficulties. Cardiac irregularities are not uncommon, and slowing or irregularity of the heart is a warning sign. Ten per cent of patients under cyclopropane, investigated by one observer by electrocardiogram, showed multiple focus ventricular tachycardia, a type of irregularity similar to that described by Levy as invariably leading to ventricular fibrillation under chloroform.

A condition called "cyclo shock," occurring some hours after administration has been noted, and it is now acknowledged that circulatory collapse and complications are more frequent after cyclopropane than after ether. Vomiting appears to be as frequent as after ether. Explosions have also been reported.

In spite of these disadvantages, cyclopropane is an extremely valuable agent, as Taylor shows in reporting on 41,690 cases, but he says that it is not recommended as the agent of choice unless it is administered by an anaesthetist well trained in its use. This opinion is supported by other observers, and in *Anesthesiology*, March 1944, seven deaths under cyclopropane are recorded, two of which were probably due to primary cardiac failure, a tragedy which is becoming distressingly frequent with this anaesthetic.

LOCAL ANAESTHESIA AND INFILTRATION ANALGESIA

The technique of Dodd, who uses local procaine in conjunction with light inhalation anaesthesia, such as can be obtained from the Oxford vaporizer, is extremely valuable. With light ether anaesthesia the very real danger of psychic shock is avoided and also the anoxia so often associated with nitrous oxide-oxygen anaesthesia. The most hopeful development of anaesthesia in the future appears to lie along these lines.

Safety margin—It cannot be maintained that local anaesthesia is entirely without risk, and deaths have been reported in the lay press and in the medical literature. There appear to be two forms of fatal reaction—convulsions and sudden collapse. A strength of 0.5 per cent of procaine appears to be safe, but digital gangrene has followed the injection of 2 per cent. solution into the base of a finger.

Some local anæsthetic agents are more dangerous than others, cocaine being the chief offender, and collapse and death are reported to have followed the use of cocaine for a nasal septum operation, and of ethocaine for removal of tonsils.

The *pre-operative use of barbiturates* is valuable, but it has been noted that although these drugs protect against convulsions when given fifteen to thirty minutes before procaine, they give no protection against sudden collapse.

In one series of cases in which local anæsthesia was used for thoracic surgery, pain occurred in 31 per cent. of cases, cyanosis in 13 per cent., nausea and vomiting in 10 per cent., and there were eight cases of reaction to the drug.

Local anæsthesia alone is unsatisfactory for badly wounded men, and the combination of local with some inhalation anæsthesia gives less shock than local anæsthesia by itself.

One serious objection to the use of procaine (novocaine), is that its use appears to interfere with the action of the "sulphonamide" group of drugs.

PREMEDICATION

Premedication should begin the night before operation by ensuring a good night's sleep, and this can usually be achieved by the administration of phenobarbitone, 1 grain. If morphine in any form is given before operation, it should be administered sufficiently early to enable its maximum effect to wear off before the inhalation anæsthesia is started. Great difficulties can be experienced with ether if the wrong sedative is used, and the omnopon-scopolomine combination has been found the least satisfactory. To avoid the restlessness, so troublesome after the use of the barbiturates, potassium bromide and chloral are given instead. For normal adult males, 40 grains of each are given, and for females, 30 grains of each, two hours before operation, with atropine 1/100 of a grain. There is no depression of respiration, although the breathing is quiet, resembling that of normal sleep, no tendency to laryngeal spasm and no restlessness after operation. The patients readily regain consciousness after a long ether anæsthesia and cases reported to take two-and-a-half hours to regain consciousness have not been encountered. There has been quite a marked reduction in post-operative chest complications since the adoption of potassium bromide-chloral premedication, and the sooner the patient comes round and coughs the better. The choice of sedative drugs before operation is one important factor in avoiding post-operative chest complications. Difficulties may be met with if alcohol is withheld before operation, especially for dental extractions under nitrous oxide gas, from those patients who are accustomed to its use.

NITROUS OXIDE AND SHOCK

It is too often necessary to-day to administer anæsthesia to patients suffering from shock. In such cases it is wise to administer safely and well an established and familiar agent. In shock the whole body suffers from lack of oxygen because of the defective circulation, and all authorities agree on the value of oxygen administration before or with the anæsthetic. Nitrous oxide-oxygen is an anæsthetic of great value, provided sufficient oxygen is administered, but it may be difficult to estimate from the appearance of a shocked or anæmic patient whether or not a state of anoxia exists. Anything less than 20 per cent. of oxygen administered with nitrous oxide may produce serious anoxia.

The altered condition of respiration and circulation which occurs under gas-oxygen anæsthesia, may be the cause of the unexpectedly low oxygen percentage found in arterial blood. Courville and others have reported misadventures in the form of death, mental derangement, and fits, following the administration of nitrous oxide-oxygen anæsthesia, when the oxygen percentage has been allowed to fall too low, and it is far safer to add ether or some other anæsthetic to the gases rather than to try to do too much with gas-oxygen only. For this purpose trichlorethylene and vinesthene are valuable agents for addition to the gas-oxygen mixture, to procure a quiet anæsthetic, but light ether anæsthesia from the Oxford vaporizer is quite outstandingly successful. It is not possible to support the view that in cases of severe shock there is a better chance of recovery if a general anæsthetic is avoided altogether. Unconsciousness is so often just what the patient most needs. The dangers associated with the use of carbon dioxide in shock have been noted by many authors.

INTRAVENOUS ANÆSTHESIA

Misadventures under intravenous anæsthesia are not uncommon, sudden death, dermatitis, laryngeal spasm, fall in blood pressure, and poor radial pulse have been noted, and serious results have followed the inadvertent injection of the drug into an artery. Fatalities usually occur during induction, but delayed recovery often leading to serious complications is not infrequently experienced.

I have lost one young patient from primary cardiac failure, and in two other cases attributed the death of the patients to the use of intravenous anæsthesia.

There would appear to be no justification for using intravenous anæsthesia for dental extractions while the patients are sitting up in the dental chair in the surgery. Its use in Cæsarean section has not been without mishaps. Intravenous anæsthesia should only be used by those practitioners who have made a special study of the subject and under conditions where facilities for resuscitation are at hand.

The physiology of intravenous barbiturates has been studied, and their harmful effects on the heart of the dog and other animals have been published. Some consider that many complications are due to parasympathetic hyperactivity, and that the post-administrative fall in blood pressure is due to reduced sympathetic activity and oxygen deprivation. The administration of atropine is valuable and oxygen *must* always be given.

Pentobarbital sodium was found to be absent in the blood of dogs 2, 17, 67 and 92 minutes after intravenous injection, but was present 32, 47 and 77 minutes after injection. Similar unexplained results were obtained with sodium amylal. The spleen becomes engorged and turgid after administration, probably due to the trapping of the red cells in the sinusoids, and it has been suggested that there is a possible relationship between these findings and the delay of onset of traumatic shock, as 30 per cent of red cells may be present in the spleen. The administration of adrenaline releases these cells. The onset of traumatic shock in dogs, following manipulation of the intestines, was shown to take place under ether anæsthesia in 3 hours 53 minutes and under barbiturates in 11 hours 33 minutes.

It has been claimed that recent discoveries disprove the theory that pentobarbital is detoxicated in the liver. Many workers have recorded marked fall in blood pressure, cyanosis and depressed respiration, the amplitude rather than the rate

of respiration being affected. There is a reduction in the flow of lymph by 50 per cent, and a fall in the oxygen-carrying capacity of the blood.

TECHNIQUE OF ADMINISTRATION—Intravenous anæsthesia can be used for short or for long operations. Macintosh advises the preliminary injection of a few minims to make sure that the solution is not being injected into an artery. There are various ways of administering *continuous pentothal anæsthesia*. A two-way syringe can be fastened to the arm after the needle has been passed into the vein, and the solution given at the desired rate. Griffin describes apparatus and technique developed for continuous intravenous pentothal with saline—

The apparatus consists of (1) a metal upright tube which carries an adjustable fibre panel supporting spring holders for funnels and screw-clips, (2) two graduated glass funnels, one to hold 300 c cm saline and the other 40 c cm of the anæsthetic solution. Rubber tubes from the funnels pass through the screw-clips and are joined by a glass U-tube to a single drip, the lower end of which is tapered to take fine-bore tubing (2 mm) which leads in turn to a fine glass indicator and intravenous needle. The funnels having been filled with the anæsthetic solution (usually 40 c cm. of a 2½ per cent solution of pentothal with 3 c.cm. of coramine), the screw-clip on the saline tube is turned on to expel the air and fill the fine-bore tubing, and then turned off, and the clip on the anæsthetic tube is then turned on and off. When the needle is shown by the glass indicator to be in the vein, the saline is started, and the needle strapped by adhesive tape to the arm.

The anæsthetic solution is given in doses as follows—the saline is turned off, the anæsthetic turned on, and the drip and graduations watched until the required amount has been given. The anæsthetic is then turned off and the saline restarted. This avoids any back-wash or tendency to levelling of the fluids in the funnels if both were turned on together.

EXTRA-DURAL CAUDAL BLOCK

Space will not permit a discussion of the various methods of obtaining anæsthesia and analgesia in midwifery, and the difficult subject of spinal analgesia in general surgery or obstetrics cannot be considered here. Continuous caudal anæsthesia for obstetrics, which consists of injecting a local anæsthetic through the sacral hiatus into the extra-dural space, must be mentioned. There are difficulties and dangers. Labour may be prolonged, and in a series of 300 cases one patient is reported as having developed infection of the epidural space, and three collapsed. The injection is sometimes given accidentally into the subarachnoid space with disastrous results, and there is also the difficulty of inserting the needle and of broken needles. Tyson considers the method offers much in the delivery of the premature infant. Adams, Lundy and Seldon recommend the use of 1·5 per cent metycaine, but they note the dangers unless precautions are taken and stress that fatal results may follow. Frequent aspiration must be carried out to see if spinal fluid can be withdrawn. Breaking of needles and unilateral anæsthesia may occur. Multiple punctures should not be made if the first is unsuccessful. Placenta prævia, uterine inertia, hysterical and psychotic states, and disproportion are contra-indications, also infective processes over the sacrum.

After the needle is introduced, a no. 5 ureteric catheter is threaded through the needle into the caudal canal and the needle withdrawn. Preliminary injection of 20 c cm is made slowly. Injection is repeated as required.

Block, Nathan and Robstein advise continuous drip procaine by gravity. 1 per cent. procaine is allowed to drip into the caudal canal at about 30 drops per minute for 20 minutes, then 15 drops per minute. They report cases of pronounced fall in

blood pressure and consider that certain highly dangerous complications are possible. Hingson and Edwards, after an experience of 10,000 cases, and although pioneers in this technique, recommend that it is best performed by a specialist in hospital. The reports published in the *American Journal of Obstetrics and Gynecology*, March 1944, are by no means satisfactory, and it can only be hoped that this method will not be adopted in this country without further investigation.

CHLOROFORM

Chloroform is a valuable anæsthetic agent which was used with success for many years, and its dangers to-day are grossly exaggerated.

In my own immediate neighbourhood, over a period of twenty years, I have known only two deaths attributable to the use of chloroform, yet during the past five years nine deaths attributable to the use of intravenous barbiturates have come to my notice.

To banish chloroform from the theatre, and to accept intravenous barbiturate and spinal anæsthesia, is to strain at the gnat and swallow the camel. Too much attention has been paid to the drug and too little to the user. The first essential of a good anæsthetic service is to have trained anæsthetists.

Disadvantages—Chloroform has a pronounced effect on the human heart, and Levy found that under light chloroform anæsthesia, fatal ventricular fibrillation can be caused by (1) intermittent administration or (2) sudden increase in the chloroform concentration (ventricular fibrillation has been recorded under cyclopropane). Delayed chloroform poisoning, which consists of degeneration and necrosis of the liver, is another danger which must be considered. Most of the recorded cases come from maternity hospitals, because when a patient has much vomiting during labour, or has undergone a very long labour, the resultant metabolic disturbances make her especially susceptible. Crawford describes three severe but non-fatal cases and two milder cases, and Gibberd three fatal cases. To obtain the full value of this anæsthetic, its use should be avoided in the induction period, and it should be used with caution and common sense in midwifery.

CONCLUSION

To anæsthetize a patient is a highly dangerous proceeding and mortality statistics tend to show that no advance in regard to safety has been made in the last twenty years, although there is now less discomfort for the patient. No real advance can be expected until the art and science of anæsthesia is acknowledged to be a subject of vital importance in our training schools, and in the general practice of medicine.

If mortality and morbidity are to be reduced there must be a more frank disclosure of misadventures, less stress must be placed on the value of any drug or method of administration and more importance attached to the training of anæsthetists. Most important of all, it must be made financially attractive to young people to serve the apprenticeship which is so necessary for the training of a safe and accomplished anæsthetist. In no other way can the general public reap the benefits of mechanical and therapeutic discoveries.

Use has been made of the work of 189 authors in the preparation of this paper but paper restriction will not permit a complete reference table. The indulgence of all those whose work has been studied and to whom thanks are due is therefore begged.

CHILD HEALTH

IV—THE TODDLERS' CLINIC

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IN recent years the work of a Maternity and Child Welfare Department has been extended to cover a wide field, and it is easy to forget that in their origins the Child Welfare Centres were in truth "baby consultations" or "baby welcomes," as they were indeed called. When the baby reached the age of twelve months the mother was expected to cease attendance, and it was a definite step forward when the age of attendance was extended, first to eighteen months and then to two years. Later the Centres have been open to children up to five years of age. There are still too many areas where nothing or very little is done for the child over two. There is also much requiring attention.

HOME VISITING

Experience shows that the mothers tend to stop coming to the Child Welfare Centres with anything like their old regularity when the child begins to walk. At this stage home visiting is essential to maintain contact. The health visitor can watch progress and direct management. Her advice is of first importance, but it cannot replace medical supervision and guidance, nor is it right that the health visitor should be expected to take full responsibility. In the past many medical officers left too little to the health visitor; this was in part due to her insufficient training in relation to child management. The modern health visitor has a more intensive and suitable training, and the standard will be raised still further in the future. The medical officer can then safely leave such matters as clothing, cleanliness, care of the skin and hair, and nursery management generally, to the health visitor. It remains the medical officer's duty to make sure that the health visitor is indeed fully cognizant of modern views. No medical practitioner should be ignorant of such detail, since child health is so closely associated with child management. Unfortunately the training of the medical student does not even now include enough practical physiology, but there are many excellent textbooks available on child care.

The Toddlers' Clinic aims at prevention rather than treatment, and the number of cases of obscure and unusual diseases and deformities seen is fortunately limited. The minor defects are only too common. Their management can be of considerable interest, and should be taken seriously in view of their importance in relation to perfect physical fitness in later life.

When visiting the homes the health visitor will stress the importance of medical supervision, and will make an appointment for attendance at the clinic. It is necessary, in addition, to supply the mother with an appointment card, either by post or by a personal visit within a few days of the date selected to ensure attendance. Close association of home visiting with the Toddlers' Clinic is an essential part of the organization. When the mother fails to attend the clinics, home

visiting is the only method of health supervision, since the practitioner will not be called in unless the child is acutely ill. It may be said that when the practitioner has the mother's confidence, and if individual visits are not chargeable, he can make a visit apart from illness, but there are two points for consideration here. A thorough examination of a well child in the home is not easy and takes longer than at a clinic, and if a child is taken to the surgery, contact with sickness is unavoidable.

ORGANIZATION OF A TODDLERS' CLINIC

The day and time must be selected after considering the convenience of the mothers. A morning session is not impossible, but as a rule the afternoon is preferred. In making appointments it is wise to arrange more than are required in order not to waste the medical officer's time. Experience shows that up to eighteen children can be dealt with in a session on an average, but it is advisable to call twenty-four to secure such an average. This means occasional rush sessions but more frequently the numbers fall below the number desired. The sessional period is two hours, but health visitors will require to attend for three hours to prepare and to clear up. The appointments are made half-hourly for each half hour. The medical officer can regulate the pace if kept informed of the numbers waiting. If a child requires special attention, a second appointment can be made for the following week, but normally these sessions should be looked upon as medical inspections, and closer supervision carried out at the ordinary child welfare sessions, or at the surgery. The idea is to examine the child quarterly and to cover a wide field.

Children are usually called from the age of eighteen months to five years. This is found satisfactory in practice. Mothers of the more intelligent type appreciate the arrangement and many come with great regularity.

ARRANGEMENT OF PREMISES AND THE STAFF REQUIRED
A waiting-room, a weighing-room, and a medical officer's room are essential. The medical officer's room must be a quiet apartment and not a screened off corner in a hall. No medical officer should be asked to work in such conditions. The weighing-room will be in charge of the health visitor, and should be equipped with an adult weighing machine of the bar and balance type, and there should also be a height measure. Washable cloaks or dressing-gowns should be provided for the children. The temperature of the weighing room and the medical officer's room should be maintained at 60° F. Receptacles for the children's clothing should be provided. The clinical apparatus required includes electrical auriscopes, electrical throat lamps, and urine testing apparatus. If possible a play-room should be available. Staffing for this is often a difficulty. A supervisor is always wanted. Sometimes voluntary workers can be obtained. Babies' cots are required, as mothers must often bring the infant who can be left in a cot under supervision.

There is a tendency to understaff clinics. Clerical help is required, and sometimes be given by voluntary workers, if available. Otherwise a clerk must be employed, either part-time or whole-time. Such a clerk will deal with the filing of case records, appointment cards, and attendance records. An attendance register showing individual visits is useful when re-calling children. A daily list showing

cases attending is also required, and should be checked with the health visitor's records. The use of an adequate filing system is essential.

The clerk will see each mother as she comes in and will take the appointment card to look out the case record. It is useful to give each case a serial number slip or quarrels arise as to precedence. Some clinics allow the mothers to take the case records, but this limits the medical officer's freedom of comment, and the clerk can hand the records to the health visitor direct.

A bell is rung in the weighing-room to sound in the waiting-room when there is a vacant chair, and the mothers enter in turn. The weighing-room should only take a limited number, not more than eight, depending on the size of the room. The children are undressed and dressed in this room. After undressing the child is weighed and measured, being given a dressing-gown. The health visitor checks or prepares the case record, and should deal with the simpler aspects of management and hygiene. The mother then waits to see the medical officer, the child remaining undressed.

The medical officer's room should be comfortably furnished, he should not accept a lack of essentials, such as a washhand basin, a trolley for apparatus, a white coat, and a properly guarded fire. These conveniences leave more time and attention for concentration on the mother and child.

Although the medical officer will generally be expected to make his own notes, all clerical work should be reduced to a minimum by the use of printed record sheets adapted for abbreviations. Letter forms and special cards are required, such as dental cards, letters to hospitals or the family practitioner. The use of a clerk for the medical officer is sometimes arranged, but it may be hampering to have an audience. In dealing with large numbers such help is valuable, but it is preferable to deal with fewer individuals more intimately.

A bell is provided which rings in the weighing-room, so that the medical officer can announce when he has completed his examination. The health visitor then ushers in the new patient with the case record. This provides an opportunity for the medical officer to give the health visitor any special instructions as to the outgoing patient, such as the completion of cards or further supervision.

THE MEDICAL EXAMINATION

The medical officer will get an immediate impression of the mother and child attitude, and will establish friendly relations. Too much formality should be avoided. The record card will show the previous medical history as well as the present condition in relation to height, weight, and so forth. A complete physical examination is required. Every physician establishes a personal routine, but with children it is often as well to leave the teeth, tonsils, and ears to the end. Posture, feet, chest and abdomen are better introductory subjects. Questions relating to nervous instability are often raised by the mothers and require careful handling.

Conditions found—It is surprising how large a proportion of the children examined are found to be suffering from physical defects of one kind or another. Carious teeth, postural and orthopædic abnormalities, and ear, nose and throat troubles form the largest proportion. Comparative figures from individual clinics would be most misleading, since the examining medical officers have such varying

views One of the problems in this work, as in school medical inspection, is the difficulty of having a generally accepted standard

With large numbers the variations level out Thus, whilst individual clinics may sometimes exaggerate the occurrence of certain defects, others will just as surely minimize them, and the final figure will give a fair estimate For this reason the Birmingham figures are of particular interest The figures quoted were published in the Annual Report of the Medical Officer of Health for 1938

Toddlers' Clinics were established at 31 Child Welfare Centres, and 1,674 sessions were held 11,798 children made 28,654 attendances This gave an average of 17 attendances per session There were approximately 46,374 toddlers on the home visiting registers The 11,798 attending the Toddlers' Clinics represent 25 per cent of the whole number Of the 11,798 children examined no less than 8,942 were noted as suffering from one or more defects on medical examination, i.e., 75 per cent Many were suffering from more than one defect

In order to ascertain the individual distribution of defects, a special study of case papers would be required Such a study would provide material of great interest Some correlation of defects might be shown, such as defective teeth associated with diseased tonsils, or the latter with lung infections This would involve the use of statistical clerks, and such expenditure is seldom approved

The defects noted by the medical officers are summarized at each session on a special form under the appropriate heading, and from these the annual reports are compiled

The Birmingham figures showed 3,171 children with defective teeth, or 26 per cent of those examined A proportion of these would show no other defect, and with the improved war-time diet for expectant mothers and young children some lessened incidence can be hoped for

Enlarged or diseased tonsils and/or adenoids were noted in 3,411 children, a higher number than those showing dental defects Here the variation of standard between medical officers creates special difficulties Some medical officers will note all enlargements, others will only note enlargements they consider permanent or due to local disease Similar considerations apply in the case of the 1,620 children noted as having enlarged glands

Conditions considered "rachitic" were noted in 1,638 cases, whilst in addition 958 children were classified as having one or more of such conditions as flat feet, kyphosis, scoliosis, talipes, torticollis, dislocated hip, pigeon chest, or other deformity Acute rickets was diagnosed in 197 children This group of defects is large The numbers amount in all to 2,793 out of 11,798, or 23 per cent of all examinees

Eye defects were found in 690 cases, including 387 with squints Otorrhoea was noted in 382, lung conditions in 445, and rheumatic heart disease was definitely diagnosed in 376 children Other matters of interest are included, of which two more may be mentioned Speech was considered backward or defective in 249 children, and in 126 there was backward mental development In no less than 1,012 the clothing was unsuitable or insufficient

The medical officers were asked to note all children having acute systemic illness during the year, e.g. pneumonia, or the infectious fevers, the figure recorded was 1,661, or 13 per cent The connexion of such illness with the defects found was not demonstrated, but there cannot fail to be a close relationship

ARRANGEMENTS FOR TREATMENT AND FOR "FOLLOW-UP"

It will be agreed that the importance of regular medical supervision in this age group has been amply demonstrated. Inspection alone would be of little value. It must be combined with treatment. This is of course fully recognized, but is not in fact made easy. Dental clinics are frequently available, often combined with school dental clinics. In Birmingham they are held in common with those for expectant mothers, and in 1938, children under five made 4,250 attendances. This does not cover the need, but is encouraging.

Many local authorities make arrangements with special hospitals, or special hospital departments for the treatment of eye conditions, and for those affecting the ear, nose and throat, as well as orthopædic defects. It is, however, notorious that the provision is hopelessly inadequate at present. Treatment is often perfunctory. It is impossible for the mother to spare the time required for repeated attendances, and the toddler must be taken by the mother. The distance from home is often a serious handicap. There can be no doubt that a great extension of treatment in local Centres for this type of disorder is urgently required. Otorrhœa alone requires specialist treatment if the incidence of deafness is to be reduced, whilst all are familiar with the prolonged and intensive treatment required for orthopædic disabilities. It is not so much a case of more medical attention, as the provision of medical technicians and apparatus near the homes. This also applies to speech defects, in which excellent results can be obtained by expert teachers. In Birmingham, 468 remedial exercise clinics for toddlers were held at fifteen Child Welfare Centres during 1938, with 7,647 attendances. The results obtained were encouraging.

A most important group requiring treatment is included under *lung affections*. Here institutional treatment is often essential owing to bad environmental conditions, and although taking children of this age from their homes is not desirable, it is often necessary for the restoration of health. For these cases, too, provision is most inadequate.

So far little has been said as to *psychological disorders* and disturbances. These are all too common. It is hardly possible to deal with any but the simplest cases at a Toddlers' Clinic. Jealousy, functional anorexia, enuresis, and night terrors, can usually be helped, if the mother and father are fully cooperative and intelligent. The more difficult cases should be referred to a Child Guidance Clinic, where the child and parents are dealt with by a trained specialist, assisted by qualified home visitors. A large proportion of the parents are most grateful for the help obtained at such clinics.

With regard to the "follow-up" of cases found at Toddlers' Clinics, this is part of the necessary routine, and is carried out by health visitors, paying special visits when necessary. It is essential, however, that the medical officers should check the results of their work, as such interest is stimulating. A simple "follow-up" routine can be arranged by entering all "defectives" on an appropriate form, according to the district in which they live. Each health visitor will be given the form for her particular area, and will be expected to visit the home within four weeks to see if the mother has acted on the advice given at the clinic. The result of the visit will be entered on the form. These forms will be shown in approxi-

mately six weeks to the medical officer at the clinic, who will determine whether further visits are required or whether it will be sufficient to await the next visit of the child to the clinic. It is not essential that every "defect" should be followed up in precisely the same way, certain cases require more and others less immediate action. Without a "follow-up" system much of the value of the clinic is lost. This applies with particular force to children suffering from psychological disorder or living in an unsatisfactory home atmosphere. The importance of prevention must never be overlooked.

CONCLUSION

The organization and administration of Toddlers' Clinics have been set out in detail since experience in this work has shown the elaboration required for efficiency. The importance of home visiting is often overlooked, it is necessary not only to secure attendance, but for "follow up" purposes in relation to treatment. Many women will gladly attend these clinics and follow instructions most faithfully. It is those who do not come whose children are in greatest need of medical supervision and treatment. The health visitors can use personal persuasion in such cases, and, for the sake of the child, everything possible must be done.

The value of the work at the clinic depends on the medical officer. To be successful there must be an interest in detail, with the determination to secure the utmost degree of perfect physical health possible in the particular case. At the same time a desire to give personal treatment is out of place, since the real object is diagnosis and securing specialized care when required. It may be said that such supervision can as readily be given by the family practitioner without the clinic. The fact remains that much of the work cannot be dealt with so simply. In the first place the family practitioner is often grossly overworked, and has little time to spare for anything but acute illness. The diagnosis of minor disabilities is more readily made with the help available at a well-equipped clinic. Above all, in a majority of instances the necessary special care can only be secured through clinics, which should be established as part of a local health service. A medical practitioner's time is too valuable for him to act as a medical technician or to undertake "follow-up" activities.

With the establishment of more nursery schools for toddlers over three, much of the work which should now be done by the Toddlers' Clinic will follow the lines of school medical inspection. It must be recognized that this fact should not be used to shelve the problems involved. In the first place it is not yet clearly appreciated that nursery schools are not suitable for the majority of children under three. Before that the child has not developed to the point when group cooperation is possible and valuable. The child under three is definitely a pre-school child and it is as an individual in the home that his natural educational sphere is found. The good mother, in the sense of the understanding mother, recognizes this. In addition, the younger child is in a position of greater danger in relation to group infections. Nursery schools should deal in general with the child from three to six years. Even in areas where nursery schools are established the Toddlers' Clinic will be required for the child from the age of eighteen months to three years. A child in perfect health at three years of age has in every sense had "a flying start."

NOTES AND QUERIES

NAIL RIDGES AFTER SCARLET FEVER

QUESTION —I recently had an attack of surgical scarlet fever. Now I notice that all my finger nails bear transverse ridges, which were never present previous to my illness. The ridges seem to correspond with the "growing" bed of nail the time of the fever. I am anxious to know the incidence of this "phenomenon" and its nature. Is it allied to desquamation? Does it with any of the other fevers, e.g., or typhoid?

REPLY (from a dermatologist).—Transverse ridges, so-called Beau's lines, are often observed across one or several nails, especially the thumb, great toe and index finger, following any severe disease of the general health, and particularly, infective processes, such as pneumonia. They indicate a temporary interference with the growth of the nail and have no other significance. The condition is fully described in the notes on skin diseases.

JUNKET AND BOILED MILK

QUESTION —A practitioner writes—"I was interested to see in Dr Asher's article (*The Practitioner*, 1944, 153, 112) that she recommends, in her diet sheet, junket for a child of six to seven-and-a-half months. As junket cannot be made from boiled milk, I wonder if I have misunderstood her, although it is true that one does not really deal with this question of boiling of milk.

REPLY —(1) *Junket from boiled milk*.—When milk is boiled a small amount of calcium is precipitated as calcium phosphate, and a small part of the lactalbumin is precipitated as a "skin" on the surface. When milk *clots*, the insoluble calcium salt of casein is formed from the soluble salt of caseinogen, by the action of rennin. The boiling of milk does not affect the conversion of caseinogen to casein, and junket can be made by adding rennin to boiled milk (I have tested this myself). It is alleged that junket can also be made with dried milk, it is not easy, however, to obtain such a firm clot with dried milk as with fresh or boiled milk.

(2) *The question of boiling milk*.—It is recommended that all milk given to infants should be boiled for two reasons. (a) Boiling destroys any organisms that may be present. (b) Boiling alters the physical character of the protein, so that curds are formed, and the milk is considered more digestible. The only substance destroyed by boiling which is known to be of importance is ascorbic acid, in any case the amount present in cows' milk is not enough for

the infant's needs, and fruit juices are always recommended.

CECILE ASHER, M.D., M.R.C.P., D.C.H.

SULPHATHIAZOLE IN SINUSITIS

QUESTION —A practitioner writes—"With regard to the Proetz displacement treatment for sinusitis, I shall be glad to know if a sulphathiazole suspension combined with a vaso-constrictor would be suitable to introduce by this method into a frontal sinus?"

REPLY —A 5 per cent. solution of sulphathiazole has been introduced after the vaso-constriction lotion. Sulphathiazole used for a longer period than fourteen days causes irritation. The drug is of doubtful value.

E. D. D. DAVIS, F.R.C.S.

PREPARATIONS OF DIGITALIS

QUESTION —Apart from the fact that certain of them can be given intravenously, is there any advantage in prescribing proprietary preparations of digitalis as opposed to the British Pharmacopœia preparations? *Digitalis folia* and *Tincture digitalis* are so much cheaper than any of the proprietary preparations that I feel reluctant to involve my patients in unnecessary expense unless there is some sound valid reason for prescribing the more expensive preparations.

REPLY (from a physician).—For oral administration none of the proprietary preparations of digitalis has any advantage over those of the British Pharmacopœia, except in the following circumstances. The tincture does not keep well once it has been diluted and even when undiluted it should be kept in a dark glass bottle. This means that occasionally the tincture when obtained from a small chemist's shop, where there is not much demand for it, may have been kept in stock for a considerable period and may therefore have deteriorated in quality. Under these conditions it may be wiser to prescribe a proprietary preparation, though even here it should be remembered that the keeping qualities of *digitalis folia* are as great as those of proprietary preparations. Again, very occasionally patients are encountered in whom the British Pharmacopœia preparations tend to produce nausea or even vomiting; in these circumstances it is worth trying one of the proprietary preparations. In the event of an emergency, when immediate digitalization is essential, intravenous administration is required and for this purpose certain proprietary preparations must be used even here, however, it must be borne in mind that intravenous strophanthin is as effective as any preparation of digitalis.

PRACTICAL NOTES

VENEPUNCTURE

THE increasing tendency for drugs to be given intravenously lends interest to the brief article by J S Lundy, R C Adams and T H Seldon (*Proceedings of the Staff Meeting of the Mayo Clinic*, March 22, 1944, 19, 152), in which they outline the technique used at the Mayo Clinic. Distension of the vein to be injected is best obtained by application of the tourniquet close (1-1½ inches) above the site of puncture. The use of a local anæsthetic is recommended as it renders the injection painless and, if carefully given, does not obscure the vein. One per cent procaine hydrochloride is used and a wheal is first raised in the skin, the needle is now advanced and some of the procaine injected into the subcutaneous tissue beside the wall of the vein. The site is then gently massaged and this disseminates the solution around the vein and at the same time ensures that the site of puncture is not obscured. When the vein is small, it is recommended that the needle should be inserted with the bevel facing downwards. The application of moist heat to an extremity is considered to be the most important of the various methods of producing distension of small or poorly filled veins.

SPINAL ANÆSTHESIA TO FACILITATE IMMEDIATE DELIVERY

IN obstetric cases in which there is no evidence of cephalo-pelvic disproportion and immediate delivery is essential, rapid dilatation of the cervix can be satisfactorily produced by spinal anæsthesia, the advantages of which over general anæsthesia are stated by S S Rosenfeld (*American Journal of Obstetrics and Gynecology*, May, 1944, 47, 699) to be—(1) easier subsequent manual dilatation, (2) the child usually cries spontaneously, and (3) as a rule there is far less blood loss than with general anæsthesia. The results obtained in five cases are recorded—In one, in which delivery was delayed thirteen days beyond the expected date and the fetal heart was irregular, varying from 100 to 180 per minute, spinal anæsthesia was induced by the injection of 150 mgm procaine, the cervix was then dilated manually, full dilatation being produced in seven minutes, and, after podalic version, a normal child delivered. In another case 80 mgm. neocaine was employed and a normal child delivered by axis traction forceps. In a third case, in which the umbilical cord had prolapsed into the vagina after rupture of the membranes, podalic version performed under spinal anæsthesia induced by 100 mgm. pro-

caine resulted in the delivery of a normal child despite the fact that the cord was not pulsating at birth. A warning is given that as cases in which there is evidence of irregular fetal heart or prolapsed umbilical cord, and immediate delivery is indicated, require no obstetric procedures, the method of relaxation of the cervical muscles by spinal anæsthesia should only be used by an experienced obstetrician, or the results may be unsatisfactory even tragic.

SMALL DOSES OF GOLD IN THE TREATMENT OF RHEUMATOID ARTHRITIS

AS a result of the use of small doses of gold salts, W B Rawls and his colleagues (*American Journal of the Medical Sciences*, April, 1944, 207, 528) claim to have obtained as satisfactory results as with larger doses and at the same time to have reduced the risks of toxic reaction whilst allowing treatment to be maintained for long periods. They used gold thioglucose in the form of solganal-B oleosum, which contains 50 per cent of gold, giving it intramuscularly to 100 patients with rheumatoid arthritis, all of whom the sedimentation rate was high. The general scheme of dosage (all doses in terms of gold thioglucose and not gold) is as follows: 5 mgm twice a week for three weeks, 10 mgm twice a week for three weeks, 25 mgm once a week. Most patients continued on 25 mgm weekly as the maintenance dose. In a few, in whom there was no improvement after four weeks, the dose was increased to 50 mgm every second week until improvement occurred or until a weekly dose of 50 mgm was reached. In patients with severe rheumatoid arthritis with high sedimentation rates, maintenance to severe anaemia, marked loss of weight, insomnia, and in older people, even smaller doses were given: 2 to 3 mgm twice a week for four weeks, then 5 mgm twice weekly for four weeks, 10 mgm twice weekly for four weeks, and finally 25 mgm weekly. The therapy was continued for indefinite periods or for at least one year. It is emphasized that no hard and fast rules can be laid down and that the precise dosage is a matter of individual adaptation in each patient. Where no symptoms appeared, treatment was suspended; it was restarted when signs of toxicity had completely disappeared. The results of treatment in this series were 53 per cent "markedly improved with almost complete remission of symptoms," 21 per cent "definitely improved," 12 per cent with "slight improvement."

advantages claimed for this form of gold therapy are that it reduces the dangers of serious toxic effects to a minimum, as they are detected at a relatively early stage before the concentration of gold in the body becomes too high, and that the treatment can be maintained over relatively long periods, thus reducing the tendency to relapse which is liable to occur when gold therapy is stopped. As 42 per cent of the cases showed some signs of toxicity, however, it is stressed that the patients must be under careful supervision throughout the whole period of treatment.

MICROCRYSTALLINE SULPHATHIAZOLE IN THE TREATMENT OF IMPETIGO CONTAGIOSA

Using a 15 per cent suspension of microcrystalline sulphathiazole in normal saline, which has the appearance and consistency of a cream, fifty cases of impetigo contagiosa among Service personnel were treated, and the results compared with those obtained by the use of ordinary sulphathiazole, 15 per cent. suspension in normal saline containing 4 per cent. tragacanth (Lieut.-Col J W Bigger and Major G A Hodgson *Lancet*, July 15, 1944, 2, 78). Cultures from lesions on the fifty patients showed on one occasion *Staph pyogenes* in 95.8 per cent., on another occasion in 96.8 per cent., and on one or more occasions in 100 per cent. *Strep pyogenes* was also present, but it was noticed that when the disease was not of more than seven days' duration the figure was only 4.5 per cent., whereas when it had lasted for twenty-nine to thirty-five days the percentage of positive cultures for this organism was 71.4 per cent. After the neck and face had been washed with soap and water, the hair around lesions on the scalp shaved or cut short, and all crusts removed (either mechanically or by bathing with normal saline) the cream was applied directly to the cleaned surface of the lesion, covered with a piece of lint smeared with the preparation and kept in place by a bandage. In extensive cases the entire face was smeared with the cream. Treatment was carried out once daily, and after the first application only fresh lesions or those oozing or crusted were treated. Of the fifty cases treated with microcrystalline sulphathiazole, forty-eight were cured within an average of 5.3 days. Of those treated with the ordinary sulphathiazole-tragacanth suspension, twenty-three out of twenty-five were cured within an average of 6.5 days. Results were also compared with those obtained by the use of sulphamylamide or sulphapyridine powder or paste, of eighty-one patients so treated, seventy-five were cured within an average of 8.4 days. Only one patient developed sensitivity to microcrystalline

sulphathiazole, a man who had been successfully treated by local application of the suspension three weeks earlier and who, after being under treatment for the second attack for ten days without appreciable effect, developed gross cervical adenitis following a rise in temperature. The man's face was covered with deep lesions, some of which contained the suspension set like cement. Sulphathiazole given orally at this stage produced sensitization erythema of the face and hands, and treatment was stopped.

A RAPID TREATMENT OF SCABIES

SCABIES is one of the scourges of war which, whilst not serious to life, can cause considerable interference with the war effort by the invalidism it produces. The aim of modern therapy therefore, as pointed out by A H Slepian (*Journal of the American Medical Association*, April 15, 1944, 124, 1127), is the use of a substance easily applied, rapidly lethal to mites and eggs, and non-irritating to the skin. In the attainment of this ideal he recommends a special lotion of benzyl benzoate which constitutes "a clean, simple, non-irritating five-hour treatment." The lotion consists of—

	Gm. or c.cm.
Benzyl benzoate	250
Duponol C	20
Aqua benzonate	sufficient to make 1 000

The benzyl benzoate is gently poured over the duponol C (a "product which contains several alcohol sulphates, chiefly lauryl sodium sulphate, some myristol sodium sulphate, cetyl sodium sulphate and stearyl sodium sulphate") in the bottom of a jug. To this the 25 per cent. aqueous solution of bentonite is added slowly without shaking. The emulsion is then agitated until all of the wetting agent is dissolved. The technique of treatment is as follows—(1) Remove all clothing, put in bag, either autoclave or send to laundry. (2) Shower, using soap freely, and scrub with particular attention to the affected parts. (3) Paint the entire body, from ear-chin line downwards, covering all folds of the body, and using a paint-brush with long firm bristles. (4) Let the lotion dry on the skin, repeat the painting in five minutes. (5) Put the patient to bed for four hours. (6) Shower and then dry well. Apply calamine ointment if any irritation is noted. (7) Clean clothes. (8) Return to duty with instructions to patient to report for follow-up examination. Of the 189 patients in whom this treatment had been applied and who had been followed for longer than fourteen days, there were no recurrences. During the course of the investigation a certain amount of evidence accumulated which suggested that this lotion might also be useful in the common accompaniment of scabies, i.e., pediculosis pubis.

REVIEWS OF BOOKS

Burma Surgeon By Lt.-Col GORDON S SEAGRAVE. London Victor Gollancz Ltd, 1944. Pp. 159 Illustrations 10 and 1 map Price 9s

THE author of this fascinating book was an American medical missionary in Burma who began his career there with no proper assistance, a rotten wooden building as a hospital and a collection of discarded surgical instruments. With great energy and surgical skill—modestly described as luck—he trained nurses, built a new hospital and established a great reputation, only to have to fly before the advancing Japanese. Fortunately General Stilwell was able to make use of Lt.-Col. Seagrave's services—hence the Army rank—and the story of the retreat from Burma to India is an epic of high quality.

Forward Surgery in Modern War By W H OGILVIE, M.D., M.Ch., F.R.C.S., Hon F.A.C.S., Hon F.R.C.S. (C), Major General, A.M.S. London Butterworth & Co Ltd., 1944. Pp. 96 Price 10s 6d. For doctors serving in any of H.M. Forces 5s 6d

ANY surgical contribution from W H Ogilvie's pen is always worthy of the closest attention. This little book will be a boon to war surgeons who read it carefully and discuss the pages with their fellows. A big book, says the old Greek proverb, is a big evil, and Ogilvie has himself doubtless wrestled with so much paper in this war to be well aware of the need for conciseness and brevity, if the fruits of his own wide experience are to be brought home to hard-worked, time-starved surgeons. To Ogilvie's wisdom and skill as a surgeon is added the gift of attractive writing, and this volume will not only be found to contain everything that a surgeon who deals with early cases of wounding ought to know, but will also provide a few most pleasurable hours of profitable reading. The work is written to help the beginner and does not purport to be a record of achievement, such as the author has set forth in various papers dealing with his experience as consulting surgeon in East Africa and the Middle East. The surgery accomplished by those who worked under his aegis does credit to his own worth and work as a consulting surgeon, thus the remarkable recovery rate of 70 per cent in abdominal wounds obtained by some of his surgical protégés approximates to the ideal in the results of treatment of this severe type of injury, and is worthy of emulation by others fortunate in their opportunity of rendering succour to their

fellow men. The reader will not readily forget the "Seven Deadly Sins of Field Surgery," that an "unepithelialized surface is *lebensraum* for any pathogenic bacteria that choose to colonize," or that the "snowy and virgin surface of a wet plaster is the ideal tablet for surgical intercommunication." Most surgeons dealing with serious cases will heartily agree with the author that "female nurses can do much more practically and psychologically than can the best orderlies." The charming and chivalrous gesture of the publishers in almost halving the price to medical officers in the Services deserves a special tribute.

Elements of Medical Mycology By JACOB HYAMS SWARTZ, M.D. London William Heinemann (Medical Books) Ltd, 1944. Pp. 179 Illustrations 80 and large folding chart. Price 21s

THE great merit of this book is that it presents the reader with an outline of the whole history of medical mycology so far as it is known, and on the whole the picture is considerably more complete than in most of the other large fields in dermatology. Practitioners in this subject may without much difficulty acquire a good working knowledge of the morphology and treatment of the diseases caused by fungi, and skill in identifying them by direct examination of suitable material under the microscope. For purely clinical practice this may be all that is absolutely necessary, but as a rule there is a natural and healthy desire to know more. Hitherto practising dermatologists have not been able to remedy the deficiency, to learn more about the fungi themselves, their classification, their elaborate morphology, and especially their cultural characteristics, by a somewhat laborious research into voluminous literature. The author has done much to remedy this state of affairs. He is a dermatologist who has made medical mycology his own subject, and the study of fungi in the laboratory his hobby. He has been able to furnish students and practitioners in dermatology with a great part of what they need to know in simple language, in a book which is quite small and compact, but which contains a vast amount of information. For the sake of clarity and of economy a good deal of the material is presented in schematic form. For the same reason there has been some sacrifice of detail, particularly in the expense of clinical descriptions. This applies to some of the quite common mycotic dermatoses as well as to the rarer ones. It is not an important defect, because many of the text books on dermatology provide ample accounts of

this aspect of the subject. The important fact is that, of the less well known and more inaccessible part of the subject, little that matters appears to have been overlooked. It is a work, in fact, that all clinical pathologists should find both interesting and valuable. There are numerous excellent drawings and photographic and micro-photographic illustrations. The book clearly supplies a long-felt want in the English language, and does it well.

Doctor in the Making, the art of being a medical student By ARTHUR W HAM, M B, and M D SALTER, PH D. London: Medical Publications Ltd, 1944. Pp 120. Price 9s 6d.

In every medical school there are to be found students with an excellent scholastic record at school who yet fail to make equally good progress in their undergraduate studies. The authors of this book are members of a committee established by the University of Toronto to investigate the causes of failure in such individuals and to act also in an advisory capacity. Their experience in this work qualifies them to write with understanding of the problems facing the new undergraduate confronted with the task of learning for himself instead of being taught, very real problems which are not always recognized by his professors and demonstrators. In spite of a tendency to talk down to the reader the result is a book which should prove of real value to student and teacher alike.

The ABC of Psychology By C K OGDEN. London: Penguin Books Ltd, 1944. Pp 144. Price 9d.

The complex subject of psychology is presented in a form easily assimilable by the general public. A discussion of the basic principles of psychology is followed by a description of the action of the neurones and the way the brain works, then come chapters dealing with the growth of mind in animals and mental growth in man. The importance of speech is emphasized and the influence of language on thought. In the chapter on the abnormal, a section is included entitled "the great abnormals," in which the author points to the well-known fact that many great men and geniuses have suffered from grave disabilities or congenital defects—in the author's words, "we should hesitate to regard good health and perfect normality as the first of human needs."

NEW EDITIONS

In spite of the fact that only eighteen months have elapsed since the appearance of the previous edition, *Medical Diseases of the War*, by the late SIR ARTHUR HURST, D M, F.R.C.P., in its fourth edition (Edward Arnold & Co, 21s)

has been subjected to considerable rewriting, particularly in the chapters dealing with infective jaundice and hepatitis and the sections on scintia and bacillary dysentery. A section on dermatophytosis has been substituted for that on the seborrhœic state, and a number of alterations in accordance with recent advances have been made in the sections on digestive disorders, hysterical post-convulsional symptoms, malaria and tetanus.

Surgery of Modern Warfare, Part VI, edited by HAMILTON BAILEY, F.R.C.S., in its third edition (E & S Livingstone Ltd, 15s), in addition to chapters dealing with wounds of the trunk and surgical diseases encountered in sub-tropical countries, contains a section on administration, which covers the ground of organization of medical services, hospital services and first-aid posts, and the transportation and evacuation of the wounded. In the appendix a section is included on the changes in transportation brought about by mechanized warfare. The appendix also deals, among other things, with chemotherapy, blood transfusion, venepuncture, bronchoscopy and the treatment of shock-hæmorrhage. As this is the final number of the sextet, the index for the six volumes is included.

THE fourth edition of *Treatment by Manipulation*, by A. G. TIMBRELL FISHER, M.C., M.B., CH.B., F.R.C.S. (H. K. Lewis & Co Ltd, 16s), has been enriched by the addition of a number of new illustrations which greatly add to the attractiveness and usefulness of the new edition. It appears at an opportune moment when manipulative measures are to the fore in the rehabilitation of civilian and war injuries.

Textbook of Surgical Treatment Including Operative Surgery, edited by C. F. W. ILLINGWORTH, M.D., CH.M., F.R.C.S.E., in its second edition (E & S Livingstone Ltd, 30s) contains a completely rewritten chapter on the treatment of burns, in which some of the coloured illustrations show well the extent of such injuries at the present time. As the title indicates, this book is not only a treatise of surgical procedures, other aspects of surgical treatment and the question whether or not an operation is indicated are discussed in detail with reference to the existing condition.

In the eighth edition of *The Diabetic A B* by R. D. LAWRENCE, M.D., F.R.C.P. (H. Lewis & Co Ltd, 4s) the war-time supplement which was inaugurated in 1941, is separately in the hope as expert author, that "readers will soon have of tearing it up." Nevertheless useful purpose in adapting the needs of the diabetic die.

NOTES AND PREPARATIONS

NEW PREPARATIONS

'BEFLAVIT' BRAND RIBOFLAVIN is now being issued in ampoules of 10 mgm for parenteral administration, in addition to the tablets of 1 mgm. and 3 mgm for oral use. The ampoules are available in boxes of 6, price 10s 6d (plus 1s 2d tax). The manufacturers are Roche Products Ltd, Broadwater Road, Welwyn Garden City, Herts.

DIENCESTROL—BOOTS—It is claimed for this new synthetic oestrogen that control of menopausal symptoms and inhibition of lactation can be obtained with smaller dosage than that usually required and there is a low incidence of side-effects. The preparation is issued in tablets, for oral administration, of 0.1 mgm and 0.3 mgm, in bottles of 25 and 100, price 1s 6d and 2s 9d, and 2s and 3s 6d respectively, and also in bottles of 1,000 tablets, for dispensing purposes, price 21s and 27s. Descriptive literature can be obtained from the manufacturers, Boots Pure Drug Co, Ltd, Station Street, Nottingham.

IODATOL is a new contrast medium for use in hysterosalpingography, and it can also be used therapeutically in the treatment of rheumatism and other conditions. As a contrast medium it is issued in bottles of 20 c.c. of a concentration of 40 per cent combined iodine, for therapeutic purposes the mode of issue is in ampoules containing 10 per cent iodine in organic combination. A booklet, entitled "Iodatol in Hysterosalpingography," has been issued by the manufacturers, British Drug Houses Ltd, Graham Street, London, N 1, copies of which can be obtained on application. Two other new preparations recently placed on the market by the British Drug Houses Ltd, are **DIENCESTROL B D H**, a synthetic oestrogen for the treatment of gynaecological disturbances, carcinoma of the prostate, and for the inhibition of lactation, issued in bottles of 25 and 100 tablets of 0.1 mgm, 0.3 mgm, and 5 mgm, and **THIOURACIL B D H**, a sulphur derivative of uracil for the treatment of hyperthyroidism, issued in tablets of 0.2 gm, 0.1 gm and 0.05 gm in bottles of 100 and 500.

ISOBROM C P L TABLETS, composed of 5 grains of bromisovalerylurea, are stated to be a non-toxic, mild hypnotic and sedative with an activity midway between the barbiturates and the bromides and valerian. It is claimed that the tablets may be taken for any length of time without producing bromism or cumulative effects, and that there is no risk of habit formation. The manufacturers are Clinical Products Ltd, The Green, Richmond, Surrey, by

whom the tablets are issued in bottles of 25 and 100, price 5s and 17s 6d. Samples and literature can be obtained on application.

PLASTER OF PARIS

IN THE TREATMENT OF BURNS

A BOOKLET entitled "The Use of Plaster of Paris in the Treatment of Burns," which has been compiled with the help of surgeons experienced in the treatment of war and civilian injuries, has been published by T. J. Smith & Nephew Ltd, Neptune Street, Hull, and a limited number of copies are available to the medical profession on early application.

THE KASHMIR C.M.S. MISSION HOSPITAL

THAT most valuable work is being done at the Kashmir Mission Hospital is shown by the Report of 1944, which contains among other items an interesting account of the treatment of eye conditions. This hospital is bravely carrying on in spite of war-time difficulties and restrictions. Subscriptions and donations should be sent to the Secretary, M.M. Auxiliary Church Missionary Society, Salisbury Square, London, E.C.4, or, in India, direct to the Hon. Treasurer, Mission Hospital, Srinagar, Kashmir.

HORMONES

THE latest issue of the journal *Hormones* has just been re-published after a lapse of some time. Copies are obtainable on application to the Organon Laboratories Ltd, Brattenham House, Lancaster Place, London, W.C.2.

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SIR HUMPHRY ROLLESTON

1862-1944

JUST as this monthly issue of *The Practitioner* goes to press the death of its former editor has been announced and it is now necessary to add the name



Characteristic pose: from a snapshot taken outside the new offices of *The Practitioner* shortly after they were opened in Bentinck Street

of Sir Humphry Rolleston as a postscript to the history of this periodical which he wrote on the occasion of its 75th birthday in June 1943. In the history he traced the birth and growth of *The Practitioner* mainly through pen-pictures of its editors, from Dr F E Anstie onwards, and he showed clearly how the personality and interests of each editor became stamped upon the quality and contents of the issues for which he was responsible. It was in 1928 that Sir Humphry took over the editorship, and, although with characteristic modesty he said nothing of himself in the history of the last sixteen years, it was clear that he brought to the journal fresh life and energy.

During his period of office there were sweeping developments in treatment, and despite his increasing age—for he was exactly six years older than *The Practitioner*—he kept easily

abreast of what was going on in the world of medicine. He followed the careers of the younger generation of physicians, surgeons and specialists with live interest and knew just to whom he might apply for a sound survey of progress in a particular field. That was part of the secret of his success as an editor, from the time of the "System of Medicine," which he edited with Sir Clifford Allbutt to the last issues of *The Practitioner* which he supervised in the early half of 1944. The other part of his success lay in a real interest in how the English language should be used in a scientific article and a conscientious knowledge of the details of proof reading and the whole technical side of journalism. When he retired in 1944 *The Lancet* spoke of him as an "arch-editor" and it is undoubtedly true that he was unrivalled in the work he had done in this important realm.

His career as a physician and his many activities in other fields are described in other journals. Here it is sufficient to pay tribute to his kindness to all those with whom he worked, his quiet humility despite his great knowledge and experience, and the heroism with which he surmounted great personal sorrow and strove to overcome the disabilities in recent times of his own failing health. He served thousands of fellow practitioners by his skilful work in the field of medical journalism, and his ever-willing help and guidance, as well as his unfailing courtesy and charming personality, will be greatly missed.

RECENT ADVANCES IN TREATMENT: SURGERY

By JOHN MORLEY, CH M, F R C S
Professor of Surgery, Manchester University

THE influence of total war on surgery, as on most other spheres of human activity, is profound. Everywhere civilian hospital staffs, including those engaged upon investigation and research, are depleted to add to the numbers of the medical services of the Navy, Army and Air Force. Those left in the field of civil surgery find it hard enough to cope with the routine tasks of treating their patients and teaching medical students, and have little time or energy left over for breaking new ground in surgery. The result is that the pace of advance in the constructive surgery of civil life tends to slacken. At the same time an enormous concentration of scientific effort is directed upon military surgery, and planned research upon a scale unthought of in civil life becomes a matter of urgent national concern. It is almost all utilitarian research, and builds upon the fundamental discoveries of the previous years. Ministries preparing for a forthcoming campaign demand quick results and do not mind paying for them. They demand increasing efficiency for the military machine, and in surgery, as in other services, time is the essence of the contract.

DEVELOPMENTS IN MILITARY SURGERY

The greatest lesson of the last war was the value of excision of the soiled, contused and contaminated tissues in the early hours before active infection by pathogenic organisms has had time to develop. In a negative sense, an important discovery was the relative futility of antiseptics.

In the present war, surgery is fore-armed by a powerful new weapon in the form of the *sulphonamide drugs*. The routine administration by mouth to all wounded men of 5 half-gramme tablets of sulphanilamide twice daily, combined with early surgical toilet of the wound and light dusting of the tissues with sulphonamide powder, has greatly increased the prospect of healing without sepsis. In recent months, however, a still more powerful weapon has become available in the form of penicillin.

Penicillin—The story of the discovery of this, the most efficient bacteriostatic agent yet known, is a fascinating one. In 1929, Fleming noticed that on an agar plate growing colonies of staphylococci, accidental contamination from the air by a single colony of *Penicillium notatum* caused lysis of the colonies of staphylococci all around it. He followed up this observation by a series of experiments which established all the essential properties of what he named penicillin. He showed that the principal pyogenic cocci and all the gas-gangrene clostridia are highly susceptible to it, as are certain gram-negative bacteria, such as the gonococcus and

meningococcus The typhoid-coli group and *Ps pyocyaneus*, on the other hand, are unaffected Fleming also proved by injection in animals that penicillin is practically non-toxic Penicillin was thought, however, to be too unstable for use in surgery, so nothing further was done to develop its use until 1939, when Florey with a group of workers at Oxford investigated it further and succeeded in establishing its practical utility There followed a period of intense effort to secure its mass production both in this country and in the United States All attempts on the part of chemists to establish the precise chemical composition of penicillin and to synthesize it have so far proved ineffectual, but the great practical difficulties of its culture and purification on a large scale have now been overcome, although it remains a relatively unstable substance that must be kept in refrigerators when in solution

The first clinical use of penicillin on a considerable scale was carried out towards the end of the North African campaign Later, in Sicily and Italy, as larger supplies became available, further striking proof of its value was obtained It is now available in quantities that are believed to be adequate for the fighting Service whilst in America for some months it has also been obtainable for civilians It is probable that by the time these words appear in print it may be available for civilians in this country Meanwhile, the cost of production is falling rapidly and the sensational costliness of the drug which received so much advertisement in the lay press recently is already a thing of the past

THE USE OF PENICILLIN IN WAR WOUNDS

It is now certain that penicillin is an ideal bacteriostatic agent in that it inhibits the growth of susceptible organisms in high dilution, its action is unimpaired in serum, blood or pus and it is practically non-toxic Both the calcium and sodium salts of penicillin are used, the former chiefly for local use and the latter for systemic or local injection, when it may be given intravenously or intramuscularly As supplied by the manufacturers, penicillin is a yellowish brown powder, or is made up in tablets It is made up into solutions with sterile distilled water, and the solution must be stored in an ice chest at 0° to 4° C and must be used within a fortnight It can be used locally as a powder, diluted with sulphanilamide containing 5 per cent light magnesium oxide This powder is stable, provided it is kept dry It can also be used as a cream with lanette wax and paraffin

It may be stated in general terms that penicillin gives better results in the early stage of acute inflammation than in the stage of chronic sepsis Whilst it is modifying the surgeon's attitude to the early secondary suture of wounds, it does not obviate the necessity for surgical excision of dead and grossly contaminated tissue and removal of foreign bodies This primary surgical toilet is carried out by the field surgical unit, but no attempt is made to suture the wounds here They are immobilized for transport and the patients are despatched to the base hospital At the base hospital the decision has to be made whether penicillin is to be administered systemically or locally

SYSTEMIC ADMINISTRATION—*Compound fractures*—In severe compound fractures, on arrival at the base, intramuscular penicillin is given for a preliminary period of twenty-four hours, either by separate intramuscular injection every three

hours or better by intramuscular drip. Then the wound is taken down, any further trimming that is necessary is carried out, the wound closed with drainage, and the systemic administration of penicillin is continued for another five or ten days. If at the end of this time the temperature is normal and there is no pain the wound may be left for three weeks before it is taken down. If the wound is not clean at the end of three weeks it is not worth while to continue with the penicillin, and in all probability further drainage will be required.

Gas-gangrene—In true gas-gangrene or clostridial myositis, penicillin must be combined with radical surgery and anti-gas-gangrene serum. By prompt surgical excision of the affected group of muscles and the early administration of penicillin systemically and of serum, the mortality of this deadly disease has been reduced in a recent series in Italy to 25 per cent. Before the introduction of penicillin it was about 50 per cent.

Septicæmia—In this condition continuous intramuscular penicillin is of proved value. Its administration should be started early without waiting for the results of the blood culture, since a delay of twenty-four hours may well be fatal. It seems probable that staphylococcal septicæmia, which is so often resistant to the sulphonamides, may be much less lethal when treated by penicillin.

In all the above conditions, as well as in certain cases of established local sepsis of severe degree, the dosage given is usually 15,000 units intramuscularly, every three hours, for a continuous period of five or ten days or, as these injections are somewhat painful, an equivalent amount may be given by a continuous intramuscular or intravenous drip. The chief objection to the intravenous route is the marked tendency to thrombosis.

LOCAL APPLICATION—There are, however, many conditions in which penicillin is better applied locally.

Soft tissue wounds—From motives of economy, both of penicillin and labour, local rather than systemic use of penicillin is advised for soft tissue wounds. In forward areas the wounds are excised or trimmed in the usual way and insufflated with penicillin-sulphathiazole powder. At the base hospital, perhaps four or five days later, if the wound is superficial and has remained clean, a further insufflation with penicillin-sulphathiazole is done, and the wound sutured. In deeper and less clean cases, at the time of suturing the wound one or two fine tubes are inserted into it by separate stab incisions, and thereafter a solution of sodium penicillin 3 c cm in bulk and containing 250 units per c cm is injected daily down each tube for four or five days, the tubes being clipped between the injections. By this method primary healing is secured in some 95 per cent of cases (Jeffrey and Thomson, 1944).

Chest wounds and head wounds—No matter how severe the infection, systemic administration of penicillin cannot be used in chest wounds or empyemas, since the drug does not enter the pleural cavity in sufficient concentration *via* the blood stream. The same applies to lesions of the brain and spinal cord and of the meninges. In an infected hæmothorax or empyema the method is to aspirate the pleural cavity repeatedly and after each aspiration to inject 30 to 120 c cm, penicillin solution of a strength of 1000 units per c cm. This is usually repeated every second day for as long as is necessary. The infection is then local.

of the infection and to ensure access of the penicillin to the whole infected area. In some cases one or more intercostal tubes are inserted and are closed with clips between the injections. It must be remembered that penicillin is ineffective in *B. coli* infections. In the dangerous sucking wounds of the thorax, in which early suture is imperative and sepsis was formerly so great a danger, penicillin, by making the early suture safe, has already saved many lives.

THE TREATMENT OF GUNSHOT WOUNDS OF THE ABDOMEN

Although the mortality of penetrating wounds of the abdomen is still very high it is tending to fall as the result of experience gained during the present war. The first question the surgeon has to answer is whether the patient is suffering from internal hæmorrhage or from perforation of a hollow viscus. If there are signs of hæmorrhage no time must be wasted on efforts at resuscitation, for if a large vessel is bleeding the hæmorrhage will be fatal unless it is promptly tied. An exsanguinated patient must be put on a blood drip and taken to the theatre at once with the drip running. The incision must be a generous one and the use of a sucker at the operation is essential. If the bleeding vessel can be secured without depriving the gut of its blood supply, a careful search is made of all the hollow viscera, and any perforations sutured. When the clinical picture is essentially one of perforative peritonitis, as shown by abdominal pain and muscular rigidity, there is less immediate urgency in hurrying the patient to operation, although every hour does count against him. The whole of the alimentary tract, from the cardiac end of the stomach to the rectum, must be examined for injuries. Wounds of the small intestine, if not too numerous or extensive, are sutured, but in the case of wounds of the colon, the contents of which are far more likely to cause a grave anaerobic infection, the line of action is different. Here, as Ogilvie (1944) has insisted, the only safe course is either to bring the perforated portion of colon, if it is still mobile, to the surface, using the perforation as a temporary colostomy, or, in the case of a fixed portion of colon, to suture the hole, drain the retroperitoneal tissue around it, and perform a proximal colostomy so as to divert the faecal stream entirely from the site of injury until all danger of infection is past. In the case of penetrating wounds of the rectum, the principle of proximal colostomy combined with local drainage at the site of injury is of vital importance.

Whilst bacteriostatic agents, such as sulphonamide and penicillin, play a not unimportant part in helping the patient to overcome infection, they are, in these cases, less important than a prompt and well-conceived operation, and careful post-operative treatment. Copious intravenous plasma or saline is used to keep up the blood volume, whilst continuous gastric suction through a Ryle's tube prevents distension and vomiting. As much as 8 pints of intravenous fluid in twenty-four hours must be given to prevent any tendency to dehydration. It is most necessary that patients with abdominal wounds should be kept at rest after operation until all danger of ileus is over, and should not be transported down the line.

PARALYSIS OF THE BLADDER IN INJURIES OF THE SPINAL CORD

The difficulties and dangers attending the management of the paralysed bladder resulting from a lesion of the spinal cord or cauda equina have long been recognized, and there has been much difference of opinion as to the best method of treatment.

Riches (1943) has described a series of 35 such cases under his care, and has come to certain definite conclusions. Following the spinal injury, the bladder passes through certain stages. These are —

- (1) *Complete retention* — This usually lasts for only a day or two, but may extend to many months
- (2) *Retention with overflow*, lasting for a variable period and succeeded by—
- (3) *Periodic reflex micturition*

The danger of the condition is septic infection, first affecting the bladder and later ascending to the kidneys. In the treatment of the retention, manual expression of urine, at one time recommended as safer than catheterization, is found to be ineffective and involves some danger of rupture of the bladder. Intermittent catheterization involves great risk of introducing septic infection, as does the use of an in-dwelling catheter, which inevitably causes urethritis before long. Riches has found suprapubic cystotomy the method of choice, provided the tube is inserted high in the bladder, midway between the umbilicus and pubis. It should be performed if possible before infection has been introduced. The use of a catheter in these spinal injuries is inadvisable on account of the great danger of sepsis.

THE TREATMENT OF BURNS

In view of the part played by the petrol engine in modern warfare it is not surprising that burns form an important proportion of the total injuries. A great deal has been written on the treatment of burns and, though it cannot be said that there are no differences of opinion on the subject, certain trends of opinion are plainly discernible.

The first-aid treatment of burns is essentially the treatment of shock. As regards the first-aid treatment of the burn itself, protection from contamination is all that should be aimed at, and it is better to avoid any greasy application or tanning agent that will be difficult to clean off at the base. Pain is treated by an adequate dose of morphine. Since reduced volume of the circulating blood is the most important element in shock, intravenous plasma by continuous drip is given as soon as possible. The hæmoconcentration resulting from the loss of plasma from the circulation renders blood transfusion inadvisable, although in cases of burns complicated by hæmorrhage it may be needed. Blood should be used to replace blood, and plasma to replace plasma loss.

In the treatment at a surgical centre the use of tanning agents, whether tannic acid or silver nitrate or "triple dye," has fallen into disfavour. The elaborate surgical cleansing of the affected area under general anæsthesia, without which tanning cannot succeed, is seldom possible, under war conditions, at a sufficiently early hour. Consequently such cleansing as can be done under morphine alone without an anæsthetic is usually carried out, and the burn covered by tulle gras and vaseline and a pressure dressing, the object of which is to prevent œdema and limit fluid loss. Sulphonamides given by mouth to prevent sepsis have proved most effective. The local use of sulphonamide cream is open to criticism, as the drug may be absorbed in large amount from the raw area and anuria has resulted in some cases. Penicillin cream or powder is not open to this objection. It will probably be used with increasing frequency. In severe burns involv

thickness of the skin the use of the Bunyan-Stannard silk envelope, with irrigation with sodium hypochlorite solution, is advocated by many, as it enables the surface to be made ready for early skin-grafting, and it allows free movement of the fingers and so obviates to some extent the risk of contractures of the joints

CIVIL SURGERY

Considerable interest continues to be shown in the treatment of *carcinoma of the prostate* by stilbæstrol and castration. Estimation of the amount of acid serum phosphatase is of great value in the diagnosis of this disease. Normally it is less than 2.5 units per 100 c cm. Between 5 and 10 units gives a strong suspicion of carcinoma, whilst over 10 units is diagnostic (Dodds, 1944). Dosage with stilbæstrol may begin with 1 mgm three times a day by mouth, increasing to 5 mgm until the symptoms are controlled, or dosage may be controlled by acid phosphatase estimation. Objections to the prolonged administration of stilbæstrol are nausea in some cases and painful swelling of the breasts. The operation of orchidectomy—usually a subcapsular removal of the bodies of the testes through a median incision in the scrotum—enables the patient to carry on without stilbæstrol.

Although treatment of carcinoma of the prostate on these lines is probably palliative, it is undoubtedly a great advance on earlier palliative measures, such as endoscopic resection or X-ray treatment. Many patients have lost the symptom and have been restored to health for two or three years, and in some cases the secondary deposits in the skeleton have receded. Stilbæstrol is apparently of value in simple adenomatous enlargement of the prostate.

Stilbæstrol in cancer of the breast—Whilst stilbæstrol has no action on cancer in general, apart from cancer of the prostate, the well-recognized susceptibility of the breast to the influence of ovarian hormones has naturally prompted the use of this drug in cases of inoperable cancer of the breast. A few reports of success in cases that had given promising results have appeared, but in a recent discussion by the radiological section of the Royal Society of Medicine reports on 100 cases treated by several individual members were received. From this discussion it appears that results are more promising in the older, post-menopausal group of patients than in the younger ones. Out of 52 women over fifty-eight years of age, six showed remarkable improvement and seventeen some improvement, whereas in 69 patients under fifty-eight years of age the results, although appreciated in about a third, were less spectacular. The whole matter is in urgent need of systematic investigation, since the treatment is at present quite empirical, and a carefully controlled series of adequate size needs studying. But there is certainly sufficient justification for giving the drug a trial in the numerous cases of recurrent cancer of the breast that have hitherto provided such a hopeless clinical problem. Results are usually apparent, if at all, soon after the treatment is started, and doses of 1 or 2 mgm of stilbæstrol by mouth are sufficient.

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TROPICAL MEDICINE

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WITH thousands of troops scattered throughout the tropics, attention has been directed to combating the ills and nuisances associated with these regions, hence recent work has mostly emanated from the medical officers of the fighting Forces

INSECTICIDES

Insect- and vermin-borne diseases are now being efficiently countered by the new United States Army louse powder, dichlor-diphenyl-trichlorethane (D D T), which is a great improvement on lethane and is efficacious against lice and also bugs. It has the advantage of being non-irritating to humans, whether used as a powder or emulsified as a spray, and possesses the great advantage of being retained in clothes, even after washing. Its usefulness was proved in the recent outbreak of typhus in Naples. It can also be employed against mosquitoes in both the imago and larval stages. Another innovation is the "freon bomb" which contains pyrethrum in a liquid compound known as "freon 12" packed under a pressure of 85 lb to the square inch, so that, on releasing the nozzle, the contents are ejected for several feet as a fine spray which volatilizes and floats around like smoke. Moreover, since the liquid rapidly becomes gaseous, the pressure is maintained so long as a drop remains. One bomb will destroy all insects in an enclosed space of 100,000 cu ft., so that it is of great use for clearing tents, planes and hangars of mosquitoes and other insects.

MALARIA

A great new achievement in the anti-mosquito war comes from Brazil (Soper and Wilson, 1942) where a campaign has been directed, not against mosquitoes in general, but against one species, *Anopheles gambiae*, which was spreading a serious outbreak of malaria and blackwater fever. By a combination of methods directed against the larvæ and imagines, this mosquito was finally exterminated in 1941, eleven years after its original introduction from West Africa.

With the shortage of quinine, the drug thiobismol has been tried in the treatment of malaria. It is, however, of little use except for benign tertian malaria (*P. vivax*) and then should be used from sixteen to twenty-eight hours after a rigor (Young, *et al*, 1943). It has the effect of suppressing one generation of parasites and of converting quotidian fever into a tertian periodicity, and is therefore most important in controlling paroxysms of therapeutically induced malaria.

THE EFFECTS OF HEAT

Experience of the effects of heat on board ship are recorded by MacLean (1943). *Muscular cramps* were the outstanding feature: only one patient developed pyrexia. The cramps were accompanied by headache, vomiting, vertigo.

panting respirations, with, in most cases, a *normal temperature*. Cramps are due to loss of chlorides from excessive sweating, so that administration of salt was the basis of treatment, two teaspoonsful of salt in two pints of water being sipped during every twenty-four hours, in addition to 8 pints of sweetened fluid to which a teaspoonful of sodium bicarbonate was added. Rectal or intravenous salines were substituted when vomiting was severe. Preventive measures before entering the danger zone are necessary, as ship's water contains little or no sodium chloride. Those advised were —

- (1) Add 1 lb. of salt to the distilled water for every 350 men.
- (2) All ratings to take half a teaspoonful of salt in a pint of water before going on watch.
- (3) To take a teaspoonful of salt in a pint of water immediately on feeling the slightest symptoms, e.g., nausea, headache or vertigo.

In contrast to this, the effects of land heat in Persia and Iraq are set out in a useful official memorandum (1943). The exogenous etiological factors were high humidity (a wet bulb temperature of 83° F. being the danger point), rapid dehydration, lack of salt and of rest, endogenous factors were non-acclimatization, alcoholism, and especially illness associated with fever, vomiting or diarrhoea. The effects of heat are classified as —

- (A) *Heat exhaustion* — Common, but not usually serious, takes the form of a faint with a tendency to heat cramps.
- (B) *Subacute manifestations* — Important, with insidious onset consisting of a pyrexial period of increasing derangement of body chemistry, with a final phase of high temperature, the symptoms being lassitude, headache, nausea and vomiting, insomnia and frequency. Chlorides in the urine are diminished. The condition lasts a week or so and requires treatment if disaster is to be averted.
- (C) *Acute heatstroke* — Sudden failure of the heat mechanism in an apparently healthy person, with loss of consciousness, delirium, coma or convulsions. The skin is dry; the temperature may reach 112° F. The face is congested and the muscles rigid. The cerebrospinal fluid is normal, but should not be rapidly withdrawn or death may result from pressure on the medulla.

In treatment the essentials are a cool atmosphere, rest, replacement of fluid and salt, and reduction of the body temperature by physical means. Cooling measures must be stopped when the body temperature reaches 102° F. (from 106° F.) or 104° F. (from 109° F.). Anti-pyretic drugs are dangerous. Large quantities of fluid in the form of 0.25 per cent saline drinks must be given, or intravenous saline if the blood pressure be below 100 mm. Hg. A balance sheet should be kept of fluid intake and output, allowing a loss of at least 8 pints per day as sweat. Intravenous administration requires care lest pulmonary oedema be induced. If there be doubt as to the presence of malaria, 8 to 10 grains of quinine should be given slowly, intravenously. A daily ration of $\frac{1}{2}$ oz. of salt should be taken *before* entering the heatstroke areas. In the hot season a minimum daily fluid requirement is 10 pints. A useful quantitative test for urinary chlorides is —

To 10 drops of a twenty-four hour specimen of urine add one drop of 20 per cent potassium chromate solution, this gives a canary-yellow colour. A 2.9 per cent solution of silver nitrate is now added drop by drop until the colour changes to brown. The number of drops of the nitrate solution required equals the amount of sodium chloride present in grammes per litre.

A minor scourge of hot climates is *prickly heat* which in Eritrea has been classified into five types (Bloomfield, 1943) —

- (1) The milary or common form

- (2) Multiple boils and painful blisters on the fingers, beginning as deep-seated, whitish swellings
- (3) Impetiginous rash, a concomitant of the common rash found on the alæ nasi and chin
- (4) Pemphigous form, in which symmetrical crops of painful blebs and bullæ filled with thin pus appear in the axillæ and groins
- (5) Secondary fungus infection of the pemphigous lesions, in which the bullæ become angry-looking pustules with black centres

Prickly heat is considered due to dysfunction of the sweat glands from over-action, leading to blocked ducts followed by swelling with congestion and rupture of the gland capillaries, dysfunction of the smaller glands causing the miliary rash, and of the larger glands the pemphigoid condition. Other varieties are due to secondary infections. The name "climatic hyperidrosis" is suggested. Treatment demands minimal sweating, minimum of clothes, scrupulous cleanliness and constant towelling to mop up the sweat. Restricted fluid intake and a diet adequate in fresh foods is advised. A lotion of zinc oxide 30 gm, menthol 2 gm, alcohol 160 c cm, water 400 c cm, as used by the Italians, is comforting.

RELAPSING FEVER

From the Middle East, Hamilton (1943) records *ocular complications* of relapsing fever, which, by reason of being delayed, may easily have their etiology overlooked. They take the form of a unilateral iridocyclitis and chronic cyclitis associated with persistent headache. No choroiditis was found and visual recovery was remarkably good. The condition occurred in some 20 per cent of those who had suffered from the louse-borne fever of the Western Desert, whereas no ocular trouble was recorded in the relapsing fever patients from Syria where the disease is tick-borne.

Relapsing fever has been successfully treated (Kammer, 1943) with sobita (sodium potassium bismuth tartrate), the dose for adults being 0.2 gm in 3 c cm distilled water, on two consecutive days, children similarly received two injections, of 0.1 gm in 2 c cm water, whilst infants were given one injection of 0.1 gm. The use of this drug has the effect of rendering the treatment less costly, and it can readily be obtained.

LEISHMANIASIS

The value of aromatic diamidines in leishmaniasis is still being investigated, and it was found (Adler and Tchernomoretz, 1942) that infections in the hamster can be effectively treated, especially with propamidine, although this is less effective than stilbamidine. Those interested are referred to other articles dealing with these preparations (*Brit med J*, 1944, Napier and Sen Gupta, 1943). *Diamidino-stilbene* is the most potent of these drugs, giving 98 per cent immediate cures with a low proportion of relapses (Sen Gupta, 1943). It is, however, not without its dangers. Intravenous injections are often accompanied by vertigo, burning sensations, vomiting and collapse, depending upon whether the reaction is mild, moderate or severe. These are distressing and alarming, although not fatal. Even more serious delayed toxic effects also occur in the form of hepatic failure, or a neuropathy unlike any of the recognized nervous diseases. The incidence of this is about 16 per cent of those treated, and has no relation to the severity of the

reaction. The manifestations are those of subjective sensory disturbances in the trigeminal area, ranging from hyperæsthesia and paræsthesia to analgesia, sometimes there is twitching of the facial or neck muscles. The condition is thought to be a toxic degeneration of the sensory nuclei of the fifth nerves in the pons, and is not peripheral. Treatment of these symptoms was singularly ineffective, although injections of cobra venom (1:100,000) in gradually increasing doses gave some relief to the subjective effects. Fortunately recovery, though slow, occurs.

On *cutaneous leishmaniasis* (oriental sore) work recently done in Russia has been critically reviewed by Hoare (1944). The disease has a high incidence in the region of Ashkhabad in Southern Russia, where the problem was discussed at a conference in 1940 (Kojevnikov), since when papers have been published by Kojevnikov (1941-42) and Latyshev and Kriukova (1941). Sores are of two types, dry and moist, dignified by the descriptive names *leishmaniasis cutanea tarda exulcerans* and *leishmaniasis cutanea cito exulcerans* respectively. The dry type, known locally as Ashkhabad or Kokand sore, has an incubation period of some months, and consists of chronic papules persisting up to one year or more. Lymphangitis is rare, parasites in the lesion are numerous and their virulence for mice low. The disease is mainly urban in its distribution and is non-seasonal. The moist type, by contrast, is known locally as Pendeh or Sart sore, it has an incubation period of only a few weeks, is an acute, rapidly ulcerating lesion commonly accompanied by lymphangitis. The parasites are scanty but have a high virulence for mice. It is mainly a rural infection occurring in summer and autumn.

Latent or inapparent infections occur, and secondary lesions are described in which the infiltration has a tuberculoid structure with few or no parasites. This has been found in other parts of the world, and it is important that these late manifestations should be recognized. I can speak personally of the difficulty in differentiating between such and lupus. This discrimination may well be required regarding lesions which may develop in members of the British Forces after their return from any endemic centre of this disease. An allergic skin test has proved highly specific as a diagnostic aid. Preventive vaccination has succeeded, but the immunity requires about one year to develop. Treatment, apart from vaccine therapy, is directed locally. Infiltration with 5 and 3 per cent solutions of acricaine (atebrin) are used for the dry and moist lesions respectively, sometimes a 10 per cent acricaine ointment is employed. Borrox (1942) advocates the application of dressings of the patient's own blood for the moist lesions, and obtains healing in two to three weeks—a remarkable result.

BACILLARY DYSENTERY

Sulphaguanidine (Bulmer and Priest, 1943; Clay, 1943) in the treatment of bacillary dysentery has converted a potential war-time scourge into a relatively short affliction. The compound acts as a local bactericide and is freely absorbed by the mucosa, so that toxic phenomena are rare and massive dosage well tolerated. The earlier the treatment is given the better, for thereby serious damage to the gut is avoided. During the first twenty-four hours 0.5 gm. per kgm. of body weight is given, followed by 0.1 gm. per kgm. for the next four days. The average total dose is from 90 to 100 gm., less if the treatment be prompt. It is considered inadvisable to discontinue treatment too soon, lest a relapse ensue.

TICK PARALYSIS

From America cases of tick paralysis have been reported (De Sanctis and di Sant'Agnese, 1943) in Long Island, whereas it was formerly found only in Canada and the North Western States. The dog tick, *Dermacentor variabilis*, proved the culprit in this case, and the species should be looked for in any children suffering from convulsions or ataxia not definitely referable to anterior poliomyelitis or peripheral neuritis.

TYPHUS

From Texas a new clinical entity of the typhus group has been described (Woodland *et al*, 1943, Livesay and Pollard, 1943) and provisionally named "bullis fever," from its occurrence in a military camp at Bullis, near Houston, Texas. Some 500 cases occurred among soldiers bitten by the tick *Amblyomma americanum* shortly before an abrupt onset of the fever which lasted from three to thirteen days and ended by lysis. It was associated with headache and enlargement of one or all groups of the lymphatic glands. The throat was injected and in 10 per cent a maculo-papular rash, lasting not more than twenty-four hours, occurred on the trunk early in the fever. Marked leucopenia was present by the third day. An infecting organism (*Rickettsia*) was found but not isolated. The disease is distinct from spotted fever or quartan fever. Thus "bullis fever" joins the already formidable list of Rickettsial diseases.

BILHARZIASIS

In bilharziasis it has been found that any mammalian schistosome can be used as an antigen for complement fixation in diagnosis, and a fluke, *Pneumonocercus medioplexus*, of the leopard frog has not only proved more convenient but has given excellent results (Culbertson and Rose, 1942). The technique of preparation is set out in the reference cited.

LYMPHOGRANULOMA

The etiology of lymphogranuloma has been considered in connexion with 120 cases in the French Cameroons (Chabeuf and Linhard, 1942). In 75 per cent the lymphogranuloma was aggravated by gonorrhœa and irritant enemata. These enemata, beloved of the natives, are concocted of pepper, astringent barks, lemon or tobacco juice, and the like. In treatment the authors used emetine injections, and dilated any rectal strictures.

EOSINOPHILIA

Recent work on eosinophilia (Frimodt-Möller and Barton, 1940) suggests that an eosinophilic response is a definite entity and may be considered a direct disease—tropical eosinophilia. In Tonking such an eosinophilia of 82 per cent with a leucocytosis of 22,300 has been recorded (Saint Etienne, 1938), and a transitory infiltration of the lungs with eosinophils has been described as Löffler's syndrome (Freund and Samuelson, 1940). This syndrome should be recognized, as both clinically and radiologically it may simulate pulmonary tuberculosis. Similar extreme eosinophilia in childhood is also recorded (Bass, 1941).

In one girl of six the condition lasted two-and-a-half months, during which time it varied from 39 to 70 per cent. The child eventually died of broncho-pneumonia. Another case in a boy was associated with vomiting, alternate diarrhoea and constipation and generalized lymphadenopathy. Leucocytosis varied between 24,000 to 45,000, whilst the mature eosinophils varied from 33 to 73 per cent. X-rays showed military pulmonary infiltration, but after three years the chest X-rays were normal, and in the course of seven years the eosinophilia gradually disappeared and the boy regained excellent health. A third case was a negro boy aged six-and-a-half years with a leucocytosis, and an eosinophilia of 22 per cent. The spleen was palpable, pyrexia 102° F, and numerous lymph nodes were present.

Two more cases of "eosinophil lung" have been recorded (Treu, 1943). The treatment adopted consisted of intramuscular injections of acetylarsan, up to a total of 36 c cm. Recovery occurred in two months.

A type of eosinophilia which constitutes Löffler's syndrome now appears established as an important clinical entity, the cause being unknown.

THROMBOCYTOPENIC PURPURA

The disease known as *onyalai*, as originally suggested by Blackie, is essentially a form of acute thrombocytopenic purpura and is not, as previously surmised, confined to natives. Response to therapy in *onyalai* is similar to that found in patients with purpura. Purpuric manifestations are characteristic of the disease, but difficult to detect on dark skins. The essentials of the diagnosis of *onyalai* are —

- (1) Spontaneous purpura and bleeding from the mucous membranes
- (2) Substantial decrease in the blood platelets, less than 100,000 per cm of blood
- (3) Clotting and prothrombin time within normal
- (4) The anaemia and leucocyte count not out of proportion to the bleeding
- (5) No pathological cells in the blood or bone marrow
- (6) No appreciable enlargement of the spleen or lymph nodes

After investigation of 21 cases the following conclusions were reached by Stein and Miller (1943) —

- (i) *Onyalai* is a form of acute thrombocytopenic purpura associated with hæmorrhagic bullæ
- (ii) It chiefly affects young male adults and is confined to South Africa.
- (iii) The course of the disease, its aggravation of menstruation and the response to treatment are similar to idiopathic thrombocytopenic purpura
- (iv) Intramuscular blood injections are not "specific" for *onyalai*, blood transfusions being better
- (v) Splenectomy might be considered should remission of the disease fail to appear within a week of transfusion

FAVISM

Favism, or "bean disease," occurs in the Mediterranean countries. It is caused by inhaling the pollen, or eating the bean, of *Vicia faba*, and is allergic in nature. The symptoms resemble those of blackwater fever, i.e., anaemia, fever, vomiting, jaundice and hæmoglobinuria with casts (Brule and Pestel, 1943). The condition can also resemble Lederer's anaemia (Robinson, 1941). In Sardinia there is a 17 per cent incidence with an 8 per cent mortality. The disease has also been recorded in the United States.

TREATMENT OF LIVER ABSCESS

In connexion with liver abscess, air replacement following aspiration is advocated (Cameron and Lawley, 1943). Drainage should be reserved for mixed infections. Before aspiration the patient is screened in the erect position and note taken of any elevation of the diaphragm. A two-way syringe with a wide-bore needle is preferred to a Potain's aspirator. Premedication with morphine and hyoscine is followed by a local anaesthetic. After the pus is evacuated, air is forced in until pain is felt either in the liver or the right shoulder; replacement with air to half the volume of pus evacuated usually suffices. A further radiographic examination is made on the following day. Manifestly, the greatest care must be exercised to avoid introducing secondary infection.

CONCLUSION

This summary has been made from a wealth of material which has been available even with war-time restrictions, and without doubt a definite advance has been made in many directions, especially in the discovery and application of sulpha-guanidine in the bacillary dysenteries.

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RENAL DISEASE

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IN many respects the treatment of renal disease has not been appreciably changed in recent years except in one particular group. This refers to pyelonephritis, the place of which is now more clearly defined in terms of histological classification, clinical recognition and knowledge of prognosis.

PYELONEPHRITIS

The infected kidney of pyelonephritis can be conveniently divided into acute, chronic, healed and recurrent forms. The condition begins as an acute pyelonephritis, generally diagnosed as acute pyelitis, although only rarely is the disease confined to the renal pelvis without involvement of kidney parenchyma. In the majority of such acute cases healing occurs in a short time, but if the infection continues, with or without remission, chronic pyelonephritis ensues and is a disease of serious prognosis.

It is possible further to subdivide the condition of pyelonephritis according to the infection appears to arise by hæmatogenous spread, or by the lymphatics, or by ascending infection of the genito-urinary tract, but whatever may be the mode of infection or the common infecting organisms, whether *B. coli* or the pyogenic or other organisms, the pathological picture seldom shows any appreciable variation.

Clinically the disease is often most evidenced in three age groups—(a) In the very young it is frequently associated with abnormality of structure or function of the genito-urinary tract, (b) in young and middle-aged women, in the so-called pyelitis of pregnancy and (c) in elderly men with genito-urinary trouble of obstructive nature, such as enlarged prostate or malignant disease. In the majority of the first two of these groups *B. coli* is the infecting organism, in the older group staphylococcal infection is frequent, and often *B. proteus* or *Streptococcus faecalis* are present.

The importance of this disease is well shown by figures from Boston City Hospital, where, in a five-year period, approximately 430 cases of renal disease examined *post mortem* showed nearly 60 per cent of cases of pyelonephritis as against 40 per cent of different grades of glomerulonephritis.

It has been noted that the *prognosis* of acute pyelonephritis is generally good. In the chronic form of the disease, however, diffuse structural changes continue in the kidneys, leading to hypertension, of benign or malignant forms, or to renal insufficiency, and the most common form of death is uræmia. The progressive nature of the chronic disease is marked by a change from a condition with symptoms of urinary infection, pyuria and frequency, to the disappearance of these signs of infection and the onset of vascular changes and cardiovascular symptoms. These latter changes may follow after a long period during which the disease has appeared to be quiescent.

In contrast to nephritis it is remarkable that the progress of the disease is not bilaterally uniform, one kidney only may be infected, or the two kidneys may present quite different stages of the disease process

Diagnosis in the later stage of pyelonephritis, that is in the chronic, healed, or healed and recurrent forms, may present many difficulties. In the acute form diagnosis is generally easier, the onset as an acute infection, with pyrexia, dysuria, pyuria or bacilluria, anaemia, pain and tenderness in one or both kidney areas, with absence of hypertension or nitrogen retention, gives sufficient guide. In the chronic forms, however, fever may or may not be present, intermission of symptoms may be prolonged, in some cases cellular deposits in the urine are always present, in others only rarely, in some cases the infecting organisms are continually present in the urine, in others they are an occasional or rare finding only. In the later cases the history of intermittent pyuria or cloudy urine with renal pain or dysuria is important in the differential diagnosis between pyelonephritis and nephritis, as the only physical indication may at that time be hypertension or renal failure.

Other diagnostic methods may assist. cystoscopy may reveal cystitis, pyelography may reveal a characteristic X-ray picture with extension of the calyces into the kidney. The diminution of renal capacity in pyelonephritis differs somewhat from that of chronic nephritis, for in the latter the progress towards failure tends to be continuous, whereas in the former recovery can occur for considerable periods of time.

TREATMENT OF ACUTE PYELONEPHRITIS

The importance of adequately treating the acute form of pyelonephritis must be stressed, in view of the serious prognosis of the chronic forms. It is not sufficient therefore to rest satisfied with a treatment which removes the infection, but the follow-up must be maintained so that complete mastery of the infection may be assured, and any early recurrences can be combated immediately.

The treatment selected must depend somewhat upon the severity of the onset. When this is accompanied by high fever and toxæmia it is often wise to exercise caution in the use of urinary disinfectants, and the patient is preferably treated in bed with a large fluid intake, low diet, and alkalis. The fluid intake should be about 5 pints and the alkalinizing medicines, such as sodium citrate 60 grains, should be given three- or four-hourly or more frequently until the urine is continuously alkaline.

When after three or four days the fever and toxæmia are subsiding, there is then a choice of *urinary disinfectants* which can be used, these can be selected from the group of sulphonamides or the salts of mandelic acid. The nature of the infecting organism is relevant here, for most of the sulphonamides are effective against *B. coli*, *B. proteus* and streptococci, although if *Staph. aureus* is present sulphathiazole must be used. On the other hand, mandelic acid preparations are effective against *B. coli* and *Strep. faecalis*. The choice between the sulphonamide group and the mandelic acid group is, however, not only dependent on the nature of the infecting organism, because there is a fundamental difference between the action of the two types of drug. So long as the theory of the occurrence of acute pyelitis, a surface infection as it were of the renal pelvis, could be accepted, the

therapeutic aim could be simply to produce a bacteriostatic urine which would exert a continuous disinfecting action on the surface of the renal pelvis. It has been noted, however, that acute pyelitis rarely exists without renal parenchymatous change, hence rational therapy requires a drug which will exert an effective action throughout the kidney substance. This type of action cannot be obtained with mandelic acid or the mandelates, and therefore the use of this group should be mainly confined to those cases in which the sulphonamides cannot be administered, either because of renal insufficiency or because it is unwise to continue using the sulphonamide group for fear of toxic effects.

This analysis also disposes of another much discussed problem. In view of the fact that the sulphonamides are concentrated in the urine, and reach a much higher level in the urine than the blood, it is suggested that smaller doses are necessary for renal infection than for general infection. It must follow, however, that the aim of treatment in pyelonephritis is to rid the whole kidney of infection and not merely to produce a self-sterilizing urine which may well be misleading; consequently, a dosage is recommended which is capable of producing a systemic action.

The sulphonamides—The selection of the best member of the sulphonamide group to use in these cases depends on a knowledge of their pharmacological activities and their physico-chemical properties. Sulphanilamide, sulphapyridine, sulphamezathine and sulphathiazole are placed here in their order of increasing activity, so that the last two members are effective against a larger variety of infecting organisms than the simpler sulphanilamide. The two latter drugs are also as a rule better tolerated than sulphapyridine. On the other hand, sulphanilamide is much more soluble in water (or urine) than the more complex sulphonamides, and this applies also to the acetylated compounds which form a moiety of the drug as excreted in the urine, consequently, sulphanilamide is much less likely to form crystals in the urine and produce obstruction or hæmaturia. Thus, although sulphanilamide is less active than the other compounds it does possess real advantages, especially when there is some degree of impairment of renal function.

The following rules can be used as a guide—

- (1) In original acute attacks with *B. coli* only present, sulphanilamide should be used.
- (2) When previous attacks have occurred, or when there is mixed infection, particularly with staphylococci, use sulphamezathine or sulphathiazole, provided there is no evidence of appreciable loss of renal efficiency.
- (3) When the infection includes *Strept. faecalis* none of the sulphonamides is likely to eliminate this infection and the mandelates must be used.

It is important to note that the sulphonamides and their acetylated compounds are all more soluble in urine which is alkaline. In view, however, of the enormous concentrating power of the kidney, adequate urine output must be maintained throughout treatment. The treatment can therefore be undertaken in the following manner—

In acute pyelonephritis the patient remains in bed throughout the febrile period. The diet at first should consist of fluids, sweetened fruit drinks, milk and thin custard or rusks, increased in the usual manner as soon as the toxæmia has obviously subsided. During this period a mixture containing sodium citrate 60 grains should

be given three-hourly, or more often, so as to get the urine alkaline to litmus after two or three days, with the subsidence of fever and toxæmia, the alkali can be reduced to four-hourly doses and the selected sulphonamide administered. The usual starting dose of 2 gm is followed by 1 gm four-hourly for two days, then 1 gm six-hourly for two days, then 1 gm t.i.d.s as a maintenance dose, but treatment should not usually be continued after the eighth day. At the same time the fluid intake must be maintained at a minimum of 5 pints a day and the urine output, which should be measured carefully, should not be less than 50 ounces per day.

The treatment should be controlled by daily microscopic examination of the urine and alternate daily bacteriological examination, and the clinical pathologist should be warned that sulphonamides have been administered, so that he can use an appropriate medium for his cultures.

The follow-up—The majority of cases of primary acute pyelonephritis will be cured by this treatment, but it is necessary to watch the patient carefully for some months to see that there is no return of infection or symptoms, in the case of pyelitis of pregnancy, obviously the observations should be continued for some time after the termination of pregnancy.

When the acute attack is a recurrence, or from the history is judged likely to be a recurrence, a full examination of the urinary tract is indicated when the infection has ceased, and should include a pyelogram and cystoscopy.

When the pyelonephritis is associated with renal or vesical calculus, or other abnormality, the appropriate steps must be taken to deal with these conditions, as otherwise infection will again become evident.

CHRONIC FORMS OF PYELONEPHRITIS

Although here it seems impossible in most cases to stay the progress of the disease, and particularly the vascular changes which may occur, the fact that even these cases sometimes show spontaneous healing with scarring or quiescence for prolonged periods suggests that every effort should be made to eliminate the infection.

In these cases complete investigation can be made immediately; in some cases the cause, such as enlarged prostate with obstruction, is obvious, renal tuberculosis must be looked for carefully, and the nature of the infection and the renal efficiency should be determined.

TREATMENT—In cases in which no surgical measures are indicated an effort should be made to treat the condition with *sulphonamides*, and here preference should be given to sulphamezathine, as a more active preparation than sulphadiazine is required. Provided there is no gross renal inadequacy, as for example if the blood urea is not raised above normal limits, the treatment given is similar to that given in the acute forms, except that a preliminary period of alkalis and rest in bed is not required. If, however, the infection is still evident, say after eight days' treatment with the sulphonamide—and it cannot be expected that all chronic cases will yield so readily—treatment should be continued with *calcium* or *ammonium mandelate*, and this is justified particularly by the coexistence of cystitis in these cases, in which the local action can be as important and effective as the systemic. During the treatment with mandelates, fluid intake should be re-

to two pints a day. These mandelates are available as proprietary preparations, ammonium salts being provided as —

Mandelin (B D H) dose 2 teaspoonfuls four times a day

Ammonet (Boots) dose 1 tablespoonful four times a day

The common salts are —

Mandelal (B D H) dose 1 level dessertspoonful in water or milk four times a day

Calcium mandelate compound (B & W) dose 1 level dessertspoonful in water or milk four times a day

While these preparations are being given the urine should be frequently tested to determine if it becomes sufficiently acid, and this can be done by adding 5 drops of buffered methyl red solution to 2 c cm. of urine (about $\frac{1}{2}$ in.) in a test tube, and a pink or pink-red colour is obtained the urine is sufficiently acid. If, however, the solution is yellow or orange, ammonium chloride, 10 grains, should be given three or four times a day. The treatment should be continued for eight to twelve days, and commonly within this time the urine becomes sterile.

It must be borne in mind that in these chronic cases the infection may disappear, only to return later, but a judicious repetition of the course of treatment, either by sulphonamides or by mandelates, can be undertaken and symptoms such as dysuria kept in check.

NEPHRITIS

Whereas in the infective renal conditions the discovery of powerful chemotherapeutic substances has been of such value in the radical treatment of the acute cases and in the palliative treatment of chronic cases, no such advances can be recorded in the treatment of nephritis. Reports of successful treatment of acute nephritis with sulphonamides have been made but in the absence of control series are not convincing. Such treatment of acute nephritis cannot be undertaken lightly because loss of renal function and anuria can appear so quickly as to render the method not without danger unless continuous laboratory control is exercised.

Other new suggestions have not fulfilled their promise. The treatment of oedema and anasarca in the subacute forms of nephritis by intravenous injections of plasma in order to restore the blood protein levels to normal has had only temporary success. Methods that have failed are not always withdrawn from the literature. For example, decapsulation of the kidneys, found useless in this same type of nephritis, is still mentioned in textbooks as a treatment for anuria in acute nephritis although it is irrational, useless and dangerous.

Opinions still differ as to the dietetic treatment of the different forms of nephritis. These differences suggest that the treatments are based on slender theoretical grounds, and therefore in a disease such as nephritis, the etiology of which is not clearly understood, it is wiser to follow general principles known to be valid. Hence the first thing to consider is the general condition of the patient and the nutritional requirements that will best maintain this condition in the circumstances of the disease.

ACUTE NEPHRITIS — The principles involved can be illustrated in acute nephritis. Here there is a relatively sharp onset, failure of renal function tends to develop quickly, nitrogen retention becomes evident and the blood urea rises to high levels. After a period of a week or more there is a progressive recovery of renal function and, following this, recovery ensues with steady diminution of hæmaturia and albuminuria. In some cases, however, albuminuria persists

differing degree and the disease enters into a chronic phase which may last for years, and the condition may either become latent or there may be progressive destruction of renal tissue. The majority of cases of acute nephritis, however, recover.

Diet—The renal dysfunction is for a time serious and of course affects the elimination of the urine with its aqueous, saline and nitrogenous constituents. It has therefore been thought that the kidneys can be spared work by restricting the intake of both fluids and foodstuffs. This is far from true, because if protein intake is reduced below a certain level the tissue proteins must be katabolized, thus producing nitrogenous bodies which must be excreted, and, further, if the total calorie intake is reduced below the metabolic requirements for complete rest in bed then tissue substances including protein will be katabolized to provide the energy requirements of the body, and again nitrogenous bodies will be produced for excretion. It therefore follows that (a) if the total calorie value of the food is not up to the nutritional need then wasting will occur, and (b) if the protein intake is eliminated, nitrogenous waste products are still produced and renal work is required for their excretion. Although the real causal factor of acute nephritis is unknown, a toxic or infective factor is probably operative, and starvation, except for a short period, can hardly be justified. As regards protein intake, it follows that such an amount of protein should be administered as will avoid loss of tissue nitrogen, and the giving of such an amount of protein does not in fact increase the amount of nitrogenous bodies that must be excreted.

A proviso should be made. In severe cases the patient may present early an uræmic condition, vomiting may be a feature, and it may be impossible for a few days to feed the patient on anything else but fluids, such fluid should be limited to two pints a day and consist of sweetened fruit drinks alternated with diluted milk. In all other cases the initial diet should consist of 30 ounces of milk providing the minimum intake of 30 grammes of protein, the remaining foodstuffs, consisting of carbohydrate and fat foods with very small amounts of associated protein, should include bread, toast, cereals, butter, jam, fruits, green leaf vegetables or salads. Salt should not be added to the diet.

Until the blood urea has returned to normal and the visible hæmaturia has disappeared, the protein intake of the diet should not be increased. The patient should be kept in bed until renal function as measured by the urea clearance test is normal and the albuminuria has cleared, but if after two months the albuminuria remains stationary, showing no progressive diminution, it is doubtful if much will be gained by a further stay in bed. Precautions, however, are still necessary, for although the patient can be given a normal diet he must be warned against the real danger of getting chilled or wet, and hence must wear warm clothes, and should avoid fatigue. Such cases have not necessarily become chronic and slow recovery may occur.

CHRONIC NEPHRITIS—This is almost invariably a progressive and irreversible process. No dietetic restrictions appear to make any difference to the prognosis. It is therefore common sense not to inflict any unnecessary restriction on a patient suffering from an almost invariably fatal condition. He should be allowed to carry on his occupation so far as he can or wishes so to do, and to eat and live in a reasonably normal manner.

DERMATOLOGY

By JOHN T INGRAM, M D, F R C P

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IT is generally recognized that the skin, after the fashion of a barometer, registers variations in the physical health and the physiological tone of the organism. To elucidate the majority of the dermatological ills presented to the physician a careful assessment has to be made of the individual as a whole, and particularly of his relationship to his environment. It is as natural therefore that many disturbances in the political, social and economic life of the community should be reflected in the skin as it is that any major changes in the general approach and practice of medicine should, if more than a medical fashion or fad and word of serious consideration, be exemplified most readily in dermatological medicine.

So it is that at this present time a review of the position of dermatology may be related to social conditions, profoundly influenced as they are by political developments, by progress in the development of social services, by war and industrial demands upon the community, and by changes contemplated in the structure of medical services and in the teaching of medicine. It is out of these influences that the most important and far-reaching advances in dermatology are likely to arise. It is to be hoped that the recognition of the importance of the skin towards which wars and rumours of wars have as yet seemed the only adequate stimulus, will not pass with the return of peaceful conditions. It has once more been recognized that dermatoses constitute one of the major sources of disability in the armed Forces and at least one branch of the Forces has established an effective dermatological service. In the industrial field, serious attention has been given by Government departments, by the administrative and scientific side of industry itself and by medical committees, to the problem of industrial dermatitis. Within the profession, proposals concerning the future of medicine recognize the need for greatly extended dermatological services, including the provision of specialists and of appropriate hospital accommodation.

From all these activities dermatology has advanced and will continue to advance. But wars and social upheavals invariably bring in their wake much scientific progress in all branches of medical practice and increased understanding of disease processes, and in this regard also dermatology has profited.

THE IMPORTANCE OF THE PSYCHOLOGICAL FACTOR

In a general way it has been instructive to observe the nature of the disability of those who have fallen by the wayside, both in the armed Forces and from the stress of conditions, especially industrial conditions, at home. These must in the main be regarded as psychological problems—failure of a sensitive or an individualist type of patient to adapt and adjust himself to the changed environmental conditions. As might be expected, a large proportion of such are cases of constitutional eczema. Not a small proportion, however, is disabled by eruptions of seborrhoeic type, the pustular eczematous state of scalp and flexures, seborrhoeic syphilis and

severe acne vulgaris (Ingram, 1944), and many are discharged by reason of severe hyperidrosis, with an associated livid erythema or pompholyx. Psoriasis also must be included among the psychogenic dermatoses which may render service difficult with the Forces or in some industries, e.g., the coal mines.

These facts are important and lead to progress in that they direct attention to an aspect of these common dermatoses which, especially in regard to treatment, is often given little attention. It is clear that little of serious value is achieved by treating an acute, widespread eczema or even a localized eczema of legs or a pompholyx of hands or feet with local applications alone, when it is one manifestation of that syndrome which to-day receives the title of "battle shock." There has been an increasing tendency to diagnose all cases of pompholyx of hands and feet as epidermophytosis or as allergic reactions dependent upon such fungus infection. Whilst it is true that this is responsible for a small proportion of such cases—probably not 10 per cent. in this country—the experience of war time restores a sense of proportion in this regard, emphasizing that the affection is essentially constitutional and emotional in origin. This is perhaps more important in regard to seborrhœic manifestations, especially infected eczemas about the head and ears, sycosis barbæ, and acne. Medical men, including dermatologists, have always been unduly obsessed with the importance of the so-called seborrhœic organisms, the monilias, diphtheroids, staphylococci and streptococci of the skin, in this group. The high incidence of these ills under conditions of strain has clearly demonstrated the importance of the seborrhœic diathesis, a constitutional predisposition to reaction by a seborrhœic pattern. Although psychological upset comes first, no doubt endocrine function is secondarily disturbed in some of these cases and determines to some extent the pattern of reaction.

The importance of psychological and endocrine disturbance is still less often appreciated in the behaviour of psoriasis, but here again the evidence is often clear and its recognition is of some importance in treatment.

THE TREATMENT OF PSYCHOGENIC DERMATOSES

It would be appropriate to comment upon a few aspects of treatment of this group of ills before proceeding to other matters. Theoretically, such problems should be referred to the psychologist, and in practice it is desirable to seek the aid of the psychologist with regard to a few of the more difficult problems, but the wholesale transfer of such work would not be intelligent or practicable. The psychologist finds the dermatological among the most difficult of his cases, probably because his medical training has not given attention to this subject and without a sound, if simple, knowledge of dermatology the psychogenic dermatoses must be a formidable problem. In practice, the majority of such patients can be reasonably restored to health and adjustment. They are intelligent but hypersensitive, and if the importance of this in relation to their adaptation to environment is explained they can appreciate its significance. The understanding of this psychogenic correlation by the patient is essential to recovery. If some degree of understanding is achieved, then assistance may be derived from a number of simple and rational measures prescribed for internal and local effects. Small doses of luminal, $\frac{1}{4}$ gram once, twice or thrice daily, are valuable for quietening the background in these

disturbed patients and in helping them to regain their equilibrium Vitamin B therapy, especially the B₁ factor, also acts, probably through nervous channels, and is of great help in seborrhœic and hyperidrotic ills

The tonic effect of general ultra-violet light therapy in small dosage, and the effect upon confidence of physical exercise and rehabilitation therapy are of importance, particularly in the more chronic type of illness. The majority of these patients are individualists, not fitted for a community and regimented life, and the recognition of this fact may be the means of avoiding much distress. Both in the army and to an increasing extent in industry this preliminary assessment and selection of individuals and their direction to suitable employment has been recognized and has borne fruit abundantly.

X-ray therapy—A few minor points in regard to particular ills may be helpful. The increasing use of X-rays to relieve functional disturbances of the skin necessarily carries dangers and risks, particularly as applied to a moving population. The greatest care should be taken to ensure that the patient has the particulars of treatment received and that he puts this information before any practitioner he consults, before further treatment is given.

Grenz-ray therapy—rays produced at a lower voltage than X-rays (10 to 12 kilovoltage) and passed through a window of Lindemann glass which does not filter off the softer radiations—has almost as wide a field of application, so far as these functional ills are concerned, as X-rays and carries less risk of damage to the skin. It is hoped that they will be more widely employed in the future. In their application to large areas of the body, damage to deeper structures is avoided.

In the more acute and *extensive seborrhœic manifestations* heavy alkalinization of the patient in the early stages—as Barber and Semon (1919) pointed out in the war of 1914-1918—favours an initial improvement. So far as local measures are concerned they should be mild. In the severe pustular, scabbed and fissured eczema about scalp, ears, eyelids, face, neck, and flexures, I have for many years used with the greatest advantage the following ointment and regard it as superior to anything yet employed—

R Salicylic acid	5 grains
Gentian violet	2½ grains
Halden's emulsifying base	120 grains
Coconut oil	120 grains
Soft paraffin	to 1 ounce

Make up in the form of an ointment

For the distressing *hyperidrosis* and livid erythema, especially of the feet, great benefit results from the use of sodium hexametaphosphate, either as a lotion for puddling (1 to 5 per cent) or more conveniently in the form of a dusting powder (5 per cent or more) with zinc oxide, talc and boracic acid. It is a harmless salt and can be adopted as a toilet routine.

INDUSTRIAL DERMATOSES

PROPHYLACTIC MEASURES—A whole volume might be written around the advances in this field of dermatology which have occurred in the past five years, but attention can only be directed to a few of the more important. The first is the necessity for selecting suitable personnel for particular jobs and the weeding out of the unsuitable. The second point is the necessity for clean working conditions, unnecessary dust, dirt, fumes, splashing, should not be tolerated. Cleanliness of the

worker is equally essential and demands the provision of effective protection and of washing facilities. In the latter regard great strides have been made in the production of *barrier creams* suited to protect the worker against most of the dermatological hazards met with in industry. They are creams which when thoroughly applied to the hands and arms, or all exposed parts, disappear into, but also leave a thin protective film upon, the surface of the skin. They are easily applied, they combine with and inhibit the secretion of the skin and carry an inert powder base. To this may be added other preparations appropriate to the particular hazard concerned. If not waterproof they are hygroscopic and are thereby lifted off the skin, after work, by immersion in water. If waterproof, they gradually wear off or are lifted off by the skin secretions after a few hours. The proper use of barrier creams can render much industrial work innocuous.

In the use of oils, paraffin and degreasers, Mummery (1944) has drawn attention to the use of effective *cleansers* after work—e.g., a sulphonated castor oil with 2 per cent. wetting agent—which emulsifies all irritant dirt and oil and removes it from the skin and pores, so that the irritant effects upon the skin are much reduced. It must be recognized, however, that these cleansing measures are not effective for those who have or acquire a specific sensitiveness to industrial contacts. Such workers must be removed to more suitable employments.

CONTACT DERMATOSES

Attention should be drawn to the increasing number of cases of dermatitis seen in practice which are dependent upon specific sensitiveness to some "contact," e.g., spectacle dermatitis due to synthetic imitation tortoise-shell and dermatitis from contact with other plastics, rubber dermatitis from contact with rubber garments or gas masks, dermatitis from cosmetics, which has increased considerably, dermatitis from dyed garments, and especially socks and shoes. Whilst this increase is in part dependent upon war-time manufacturing processes, especially in dyeing, it should be noted that other contact dermatitis, e.g. actinic, appears to have increased in recent years.

Khaki dermatitis has figured largely in army patients and often presents a confused picture in which dye or chrome sensitiveness plays some part, in which other factors, including the constitutional and psychological, figure. Davies, and Barker (1944) have reviewed this problem. That it is often a contact dermatitis is clear from the number of cases which are discharged from the Forces.

contacts must be treated Mellanby's work on sensitization of the skin to scabiet products, which is responsible for itching and other features of the disease, explain why cure is not always followed by immediate relief of symptoms

The use of derris and the thiocyanates as repellents in the treatment of *pediculosis* has proved of less value in the field than laboratory work had promised

Blackstock's (1944) observation that ascabiol, a proprietary preparation of benz benzoate in an emulsion, often destroys lice and nits and, in addition, loosens nits from the hair, is the most important advance in this field and promises to point the way to success A more effective parasiticide in this valuable base would be ideal and might also incorporate a repellent for prophylaxis

Tinea—It must be noted that ringworm infections are seriously increasing Ringworm of the scalp in children under puberty, which had become a rare disease, is assuming epidemic proportions, and again the responsibility of public health authorities in utilizing modern methods of detection in the diagnosis of small-spore ringworm of the scalp should be stressed if the tide is to be stemmed

When a case of ringworm of the scalp is detected in a child, all susceptible contacts and all children under puberty in the family circle, in the class and the school attended by the child, should be examined by the ultra-violet light filtered through Wood's glass, which rays cause small-spore ringworm to fluoresce and make the detection of cases easy The appropriate Ministry should impose this responsibility upon all school and local authorities, instead of leaving such prophylaxis to the whim of the individual medical officer X-ray epilation of infected cases by the technique devised by Cochrane Shanks (1938) somewhat simplifies this procedure, though it should only be undertaken by the experienced Thallium acetate, used by some dermatologists in the treatment of younger children, is no longer available in this country Animal ringworm is also more rife but is treated effectively by an alternation of Whitfield's ointment and the following paint, and the judicious use of fomentations to remove pus—

R Benzoic acid	
Salicylic acid	of each 10 grains
Halden's emulsifying base	120 grains
Soft paraffin	to 1 ounce
Make up in the form of an ointment	
R Mercuric chloride	$\frac{1}{2}$ per cent
Brilliant green	$\frac{1}{2}$ per cent
Industrial spirit	to 100
Make up in the form of a paint	

CHEMOTHERAPY

The treatment of septic conditions of the skin by *sulphonamides* locally is much in vogue—a 5 per cent sulphathiazole cream in an emulsified base being a favourite application, or a powder or paste Dusting of abraded and raw surfaces with sulphanilamide powder is widely employed in the Services

These procedures may be satisfactory in the treatment of surgical wounds and perhaps of burns—of which I have little experience—but I am not alone in being strongly of the opinion that the measures are unnecessary and undesirable in the treatment of simple sepsis, impetigo, sycosis, abrasions, infected scabbiness and eczematous affections Epidermal sensitization to sulphonamide is common and

produces an acute eczematous state causing disability for several weeks, if not months. The affection is being seen increasingly, both in civilian and Service cases, and the indiscriminate use of these dangerous drugs should be condemned.

Better results are obtained, when this measure is necessary, by the internal route, as sensitization is less common and of a relatively trivial character—an urticarial or morbilliform erythema of a few days' duration being the common manifestation.

Penicillin will no doubt replace much of this indiscriminate sulphonamide therapy and would appear to be a safe measure. Preliminary investigations (Roxburgh *et al.*, 1944) suggest that, as would be expected, it is an effective local remedy for staphylococcal and streptococcal infections—impetigo, boils, carbuncles, infected seborrhœic eczema, sycosis. It is by the internal route—intramuscular injection—that its value in the more obstinate and chronic infective dermatoses is likely to be appreciated, but supplies have not yet allowed extensive investigation of this field.

VITAMIN AND ENDOCRINE THERAPY

Steady advance is made in the assessment of the value of vitamin therapy. *Vitamin A* is regarded as playing some part in the etiology and treatment of ichthyotic affections and of pityriasis rubra pilaris and Darier's disease. In the latter disease I have not found it of value, in the former it sometimes influences the course of the disease without producing dramatic and convincing effects. Many ichthyotic subjects are more comfortable while taking vitamin A. Some chronic infective conditions—especially tuberculosis and chronic erysipelas—are improved, and a few cases of light sensitization seem to benefit.

The *vitamin B complex* is of more value, particularly in seborrhœic and pityriasis-form lesions, in fissured orificial affections and in some neuro-dermatoses. In all these ills the vitamin aspect is only one part of the whole problem—which is rarely a nutritional problem only—and in this country it is rare even in war time to see a dermatosis reflecting a serious vitamin deficiency.

Hormones—The rôle of endocrine factors in various disturbances—more especially the seborrhœic disorders—is becoming a little clearer, though much remains obscure. An undue balance of androgenic over œstrogenic hormone would seem to play a part in the etiology of some cases of acne and a few of rosacea. Seborrhœic sycosis and seborrhœic warts, among other disorders, are sometimes influenced favourably by stilbœstrol therapy by mouth or other route, but it is rather as a field in which much is to be anticipated than as a practical line of treatment that this is mentioned. Hormonal therapy is not without known and probably unknown dangers and, until effective and valuable therapy has been put on a more sound basis, it should be approached with caution.

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Sometimes the pus fails to yield organisms on culture, due either to the lethal action of systemic sulphonamide or to drug carried over in the pus inhibiting growth on the culture media, the use of *p*-aminobenzoic acid in the media obviates the second possibility. In young children, extension of inflammation downwards to the glottic region is also common and may produce urgent dyspnoea in a matter of hours, increasing insomnia and restlessness with onset of blue or livid cyanosis. demand immediate relief by tracheotomy. In experienced hands, laryngoscopic examination, followed by aspiration and if necessary direct intubation, gives better results than tracheotomy, in which, however, the outlook has been greatly improved since the introduction of sulphonamide, which often effectively prevents pneumonia or promotes early resolution.

Rhinitis and inflammatory or allergic conditions of the nasal and paranasal sinuses are common complications of the infective diseases, particularly of measles and whooping-cough. Removal of adenoids (and sometimes of tonsils) may be required although generally operation is best deferred until the acute stage has passed. Zinc ionization of the nasal mucosa and Russell's displacement method for sinus infections have given good results in suitable cases. Air is removed from the sinuses by means of a modified breast pump and 0.5 per cent ephedrine hydrochloride in saline, or methedrine, introduced, by this means blocking of the sinus from œdema is relieved and escape of secretion and normal entry of air promoted.

LOWER RESPIRATORY INFECTIONS

The clinician often feels, with little justification, that he has a better therapeutic control over lower respiratory tract infections compared with those described above due perhaps to the favourable outlook in a high proportion of the pneumonic inflammations encountered at the present time. Laryngeal and tracheal inflammation may be rapidly succeeded by *acute bronchitis* and *bronchiolitis*, which in the young rachitic subject may lead to suffocative œdema or obstructive dyspnoea due to bronchiolar spasm or to tenacious plugs of mucus, manifested clinically by lower intercostal indrawing, in sharp contrast to the supra-clavicular and upper thoracic indrawing of laryngeal obstruction. Sedatives and atropine may be dangerous unless administered carefully, adrenaline chloride 1:1,000, in doses of 0.25 to 0.5 c.c.m., or ephedrine sulphate, $\frac{1}{4}$ to $\frac{1}{2}$ a grain for a child of one year, repeated as required, perhaps with the addition of an expectorant mixture and frequent changes of posture are measures more likely to give relief, in severe cases bronchoscopic aspiration and oxygen (to which carbon dioxide may sometimes be added) by a suitable tent may be required. Sulphonamides, -mercapt, -thiazole or -diazine, should be given in full doses and rarely cause toxic effects provided adequate fluid intake is maintained. A suitable dosage is—

	First day	Daily maintenance dose
Up to 10 lb	3 gm	1.5 gm
10-25 lb	4 gm	2 gm
25-50 lb	6 gm	3 gm

Given four-hourly on the first day and six-hourly on subsequent days, the total duration is usually seven days but may be extended to ten or even fourteen days.

Determination of the drug level in the blood is always advisable before lengthening the course, as wide variations in levels are encountered in children as frequently as in adults. Children tolerate sulphonamides well, the only risk being liability to renal damage in the presence of concentrated acid urine.

Spontaneous resolution may occur without chemotherapy but the tendency to broncho-pneumonia is high, usually damage is both alveolar and interstitial, but not necessarily simultaneous. Short of manifest pneumonic consolidation, considerable permanent lung damage may occur; whooping-cough has a particularly sinister reputation in this respect, often so insidious in its course as to be unsuspected unless controlled by serial radiological examinations. Fibrosis and emphysema are common sequels. Empyema is infrequent nowadays, streptococcal pus is always best removed by a closed drainage method, whilst pneumococcal abscesses usually require open drainage by rib resection. Small doses, 10,000 to 15,000 units, of penicillin suffice to sterilize the majority of empyemas.

SPECIFIC FEVERS

As the same general principles govern the management of fevers a detailed description for each disease is unnecessary, but recent trends in investigation and treatment deserve mention. In obviously ill patients blood culture should always be undertaken before treatment is begun, as well as blood counts, sedimentation determinations and, when indicated by the nature of the eruption, bleeding and coagulation times and prothrombin index.

The presence of collapse, coma or low blood pressure should suggest among the usual investigations an estimation of blood sodium and potassium which might furnish valuable information on suprarenal involvement, especially in diphtheria, cerebrospinal fever and infantile gastro-enteritis, timely administration of cortical extract or desoxycorticosterone acetate may tide the patient over a dangerous period. Administration of glucose in large amounts is not a new measure and recent work casts doubt on its value in preventing liver damage, but a buffered salt infusion, such as Hartmann's solution, with human plasma or serum, given intravenously, is an undoubted life-saving measure in states of shock or collapse, especially if accompanied by tissue dehydration. The improved dietary of the population is probably responsible for the greatly reduced incidence of convulsions in fevers, either at the onset or during their course, particularly in whooping-cough. Terminal convulsions in toxæmic states are also less frequent, perhaps due to the same cause, but the use of buffered solutions with the aim of re-establishing the alkali reserve mechanism, together with calcium gluconate, parathyroid extract and sodium gardenal, may be partly responsible. Low inorganic calcium levels should be taken to indicate deficiency, although a normal level is compatible with a deficit of the active ionized form, the content of which can only be determined by a physiological method involving the use of frogs.

Blood transfusions are usually contraindicated until dehydration is corrected, in severe infections accompanied by septicæmia, hæmolytic may be rapid and severe, necessitating repeated transfusions, preferably of recently drawn blood.

Antitoxins and anti-bactericides—The unique place of preformed antibodies in

PREVENTIVE MEDICINE

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DURING five years of war this island country has escaped famine, and the toll of pestilence has been small, but the vast increase in speed and volume of air transport has brought the people not only into more rapid contact with infection from abroad, but also within easy reach of diseases from which formerly the country was considered secure. It will be of interest therefore to inquire how much better Great Britain to-day is equipped to prevent and control some of the infections to which the nation is exposed.

The practice of preventive medicine from the aspect of infective disease is still carried out on traditional lines. The line of action is directed towards one or more of the three main factors in the spread of infection—(1) The source—elimination of the infective agent by removal of the source of infection, by clearing up the carrier state of the individual, by detection and control of the carrier as well as the ambulant and acute cases. (2) The path of spread—the closing of channels of communication or the elimination of the vehicle by which the infecting agent is conveyed from reservoir to victim. (3) The potential victim—increase of resistance at threatened points by immunization of the individual or of highly susceptible or especially exposed groups of the population at risk.

Advances in knowledge have recently been made along all three lines and are being applied increasingly in practice. The recently published War Memorandum No. 11 (M.R.C., 1944) on "The Control of Cross-Infection in Hospitals," an admirable symposium on the application of both new and old and tried measures, contains information of practical interest and value to the general practitioner, as much of the sound advice and methods advocated are equally applicable in the home.

DYSENTERY

The introduction and increasing use during the war years of new and highly selective culture media for faecal specimens have increased knowledge of the widespread endemicity of Sonne dysentery in this country, also the rectal swab technique (Cruickshank and Swyer, 1940) has greatly simplified the collection in a household of multiple specimens for laboratory examination. The occurrence of gastro-enteritis spreading through a household, usually mild and transient, but occasionally severe and on rarer occasions fatal in children and old persons, is often found to be due to *B. dysenteriae* Sonne. Also, members of the household who have not been ill may be found to be ambulant or "missed" cases or symptomless excretors of the infecting organism, and specimens from them should be examined. Furthermore, contrary to current teaching that the Sonne dysentery bacillus ceases to be excreted within a day or two of cure of the clinical condition, the organism not infrequently continues to be excreted for many weeks and even months. Infection is most frequently introduced into the home by a child of school age, and the danger of spread to other members of the household, and especially

to children of pre-school age, is high. Persistence of the infecting organism in the stools of convalescent patients and symptomless excretors provide foci for further dissemination. Such persons should be given advice regarding their personal hygiene, in particular washing of the hands after every visit to the closet, avoidance of soiling articles of clothing and of handling food or preparing meals.

A recent outbreak of Shiga dysentery with two fatal cases among inhabitants of a Norfolk village (Green, O'Connor and Macdonald, 1944), in which none of the victims had been out of the country, provides evidence that under war and post-war conditions it will be necessary to be alive to the possible introduction into this country of infections rarely or never seen in times of peace.

The sulphonamides—In recent outbreaks of bacillary dysentery of Flexner, Shiga and Sonne types occurring at home (Swyer, 1943), and among troops in the Middle East (Paulley, 1942, Scadding, 1944), some of the sulphonamide drugs, sulphaguanidine in particular, have produced dramatic results, not only in curing the clinical condition but also in preventing and clearing up the carrier state.

ENTERIC INFECTIONS

Apart from one or two outbreaks of some magnitude of paratyphoid B fever, the incidence of enteric fevers continues to decline. Differentiation in the laboratory of *B. typhosus* and *B. paratyphosus* B into numerous types based on selective bacteriophage action on the Vi antigen of Felix (Craigie and Yen, 1938; Felix, 1943, Felix and Callow, 1943), has permitted more accurate determination of the paths of spread of infection (Bradley, 1943, Hutchinson, 1943) and the correlation of sporadic cases occurring far apart in time and distance. Here again, improved bacteriological methods have confirmed the importance of the "missed" case and the symptomless excretor as sources of dissemination of infection, and have shown that carriers and convalescents may exhibit long periods of intermission of excretion of organisms, up to six weeks or more (Gell and Knox, 1942). Although the test for the presence of Vi-antibody in the serum facilitates the discovery of carriers of *B. typhosus*, there is still no drug effective in clearing up the carrier state.

A new vaccine (Felix, Rainsford and Stokes, 1941), T A B C, recently introduced, is an improved edition of the old phenol-preserved T A B vaccine, as it is preserved in 22.5 per cent. alcohol and contains *B. paratyphosus* C in addition to the time-honoured enteric organisms. The object of the alcohol is to preserve the Vi-antigens (Felix and Pitt, 1934) which are destroyed by phenol and other antiseptics, in the case of *B. typhosus* it has been shown that the Vi-antigen is a factor of some importance in the stimulation of production of protective antibodies. The inclusion of paratyphoid C organisms in the vaccine widens its antigenic range, so that it may be expected to stimulate the production of antibodies to many of the *Salmonella* organisms, which cause food-poisoning. Alcohol-preserved T A B C is now in wide use in the fighting Services.

STAPHYLOCOCCAL FOOD POISONING

In recent years numerous outbreaks of staphylococcal food poisoning have been reported, caused by the ingestion in food of pre-formed enterotoxin produced by enterotoxigenic strains of *Staphylococcus aureus*. The explosive nature of the outbreaks, the short incubation period of two to six hours (average three hours) after partaking of the suspected foodstuff, and the clinical picture of vomiting, sometimes

severe, and diarrhoea often associated with great prostration, lasting for twenty-four to forty-eight hours and followed by rapid and complete recovery, present a syndrome that is almost pathognomonic. The source of the infection is most frequently the upper respiratory tract, and especially the nose of the cook or of the person handling the food in the shop, restaurant, canteen or home, and infection is probably conveyed to the food *via* the hands. The person who harbours profuse *Staph aureus* in the nose is regularly found to harbour them on the hands and some progress is being made in tracing outbreaks to their source by serological and phage typing of strains isolated from patient, infected foodstuff and carrier. Knowledge that the infected food, usually cold cooked meats, milk, cream, custards or cake fillings, does not become poisonous for some hours after infection, while the toxin is being produced, and that once formed the toxin is resistant to boiling for a short period, provides the basis for prevention, i.e., the protection of food by impermeable wrappings, washing the hands prior to handling or preparing food, minimum handling of food and, most important in the kitchen, the handling of food and preparation of dishes only a few hours before they are to be cooked and eaten, and the protection of food in clean, covered receptacles in a refrigerator or cool place, in order that any staphylococci present in the food may have neither the time nor a suitable environment in which to multiply and produce toxin. Apart from the family household, the great increase of communal meals in canteens, restaurants, schools and in the fighting Services renders the observance of these recommendations of paramount importance.

WHOOPIING-COUGH

This disease has shown a steady decline during the last forty years, but it comes second only to diphtheria as a cause of death among children, and has a high attack rate on the child population. More promising for early diagnosis than the time-consuming cough plate is the *post-nasal swab technique* recently described by Cruickshank (1944). The swab is inoculated on to Bordet's medium and the addition of about ten units of penicillin in solution inhibits the growth of other bacteria.

Prophylactic vaccination has been actively investigated, especially in the United States (Sauer, 1939, Bell, 1941, Kendrick, 1943), in recent years. The results claimed in the diminution of pertussis in the immunized have been good, but not all the trials have been carried out under fully controlled conditions. A few trials under such conditions have been carried out in residential nursery schools in this country, and it must be admitted that the results have so far been disappointing, the incidence of clinical pertussis being as high in the immunized as in the control groups. It is still too early to assess the rôle of pertussis toxin in producing the disease, but it may well prove that a vaccine containing both bacteria and toxin will provide the best prophylactic antigen. Meanwhile, too high hopes should not be placed on vaccine prophylaxis, although a vaccine that permits of only a modified attack is better than none. The fact that pertussis attacks infants at an early age, nearly half the deaths occurring during the first year of life, indicates that immunization, which takes about three months to attain its maximum, should be begun before the age of six months, that is, before immunization against diphtheria which has a later age of attack. Whooping-cough in infants and young children is often introduced into the home by older children in the family who have not

tracted the infection at school, and an additional and indirect method of protecting the former is to immunize children of school age who have not had the disease

DIPHTHERIA

The campaign for active immunization against diphtheria initiated in 1940 is at last beginning to bear fruit, and the value of immunization is now generally accepted. Diphtheria statistics published recently by Stocks (1944) show in 1943, compared with 1942, increases in deaths at ages under 1 and over 15 years, contrasted with decreases at each age-group between 1 and 15. As the age-groups 1 to 15 include a high percentage of those inoculated, the figures strongly suggest that had it not been for immunization a rise in total diphtheria mortality for 1943 instead of a fall would have been recorded. The figures in the following table, kindly supplied by Dr Percy Stocks, show diphtheria incidence and total deaths in England and Wales from 1936 to 1943, with deaths in the age-groups 0-1, 1-5, 5-15 and 15+, the downward trend since 1941 in total notifications, total deaths and deaths at ages 1-5 and 5-15 is marked, the figures of total notifications and total deaths for 1943 being the lowest recorded.

DIPHTHERIA NOTIFICATIONS, ENGLAND AND WALES, 1936-43, INCLUDING NON-CIVILIANS (1936-39 corrected to 1940 classification)

Year	Total Notifications	Total Deaths	Total Deaths at Ages			
			0-1	1-5	5-15	15+
1936	57,795	3,003				
1937	61,341	2,898	66			
1938	65,008	2,861	69	1,010	1,727	200
1939	47,343	2,133	57	1,007	1,620	202
1940	46,280	2,480	41	916	1,693	195
1941	50,797	2,641	58	775	1,166	151
1942	41,404	1,827	75	915	1,327	180
1943	34,696	1,370	43	1,106	1,209	251
			57	687	907	190
				478	614	221

During the two years 1942-43, it is estimated that about five out of six of the children notified as suffering from diphtheria, and about twenty-nine out of thirty of those dying from diphtheria, were not immunized. It is also estimated that in England and Wales by June 30, 1943, about 42 per cent of the child population aged one to five years, and about 60 per cent of children aged five to fifteen years, had been immunized. The level of immunization has just been reached at which decrease in the incidence and mortality of diphtheria may be expected, and to achieve better results the campaign must continue to be prosecuted with vigour. The need now is to concentrate on the child of pre-school age, in which group much higher percentage will have to be immunized before any significant decrease in incidence and mortality can be expected. Since January 1943, diphtheria prophylactic (A P T) has been available from medical officers of health domiciliary immunization, when considered necessary, and a fee is payable by local authority. With the diphtheria prophylactic at present available a Schick version rate of upwards of 98 per cent is regularly obtained. In children who have been immunized in infancy the value in maintaining immunity of the boosting of 0.5 cc. at school age should not be forgotten.

INFLUENZA

Experience gained during a mild outbreak of influenza due to virus A at the end of 1943 raises the question, what is the present position regarding prevention with a view to future outbreaks? Apart from the general recommendations regarding coughing and sneezing, use of handkerchiefs, free ventilation, avoidance of crowded places and self-isolation if attacked, recent trials with *influenza virus vaccines*, carried out in the United States under the ægis of the United States Commission on Influenza (1944), are promising. The vaccine used was ten times more concentrated than previous vaccines, and contained both virus A and virus B. An outbreak of influenza A occurred at the optimum time and the vaccinated had an attack rate of 2.2 per cent as compared with an attack rate of 7.1 per cent in unvaccinated controls. Whilst this augurs well, there is much still to learn, for example, whether or not the success was due to the use of a more concentrated vaccine, and the duration of immunity following vaccination. Evidence suggests immunity following vaccination with virus A is transient, the next outbreak may reveal a virus different from A and B viruses, upsetting any plans for preparation of virus A and B vaccines on a large scale. There is also the difficulty of the enormous number of eggs required to manufacture vaccines on a large scale, but it would seem desirable to have supplies of vaccine available for use at the earliest signs of an approaching epidemic.

OTHER INFECTIONS

SMALLPOX—The recent outbreaks of variola major in this country are cogent reminders of the risk of importation of disease to which the population is exposed, in spite of strict precautions taken at sea- and air-ports, and of immediate and vigorous steps to be taken to prevent spread of this virulent infection in a population with a level of immunity insufficiently high to limit serious outbreaks. Spread of the disease can be effectively controlled if the outbreak is promptly dealt with by the sanitary authority, but the enormous amount of time, labour and searching inquiry necessary to achieve control is probably not generally realized.

Tracing contacts—Following diagnosis and removal of a case to a smallpox hospital, and disinfection of the house and its contents, the next steps are to try by careful interrogation of the patient, to trace the source of infection, if indigenous, and to trace contacts and offer them vaccination or revaccination. As it is of the greatest urgency to vaccinate contacts successfully within twenty-four hours of exposure in order wholly to prevent an attack, the search for contacts must be pursued relentlessly, and when a case occurs in a large general hospital, as happened recently, it may be necessary for the medical and clerical staffs to work round the clock in relays until all contacts, possibly hundreds, have been traced, examined and vaccinated. Only contacts are vaccinated and not contacts of contacts. Full notes are made for each contact of date and place of contact, vaccination history, nature and place of work, medical examination, times visited while under surveillance and results of vaccination or revaccination. All medical practitioners in the area are informed of the occurrence of smallpox, and during an outbreak chickenpox may be made temporarily notifiable, so that cases may be seen by those expert in the diagnosis of both diseases. Smallpox modified by previous vaccination may be extremely mild, with only one or two pocks on fingers or face, making diagnosis

difficult, and necessitating the most careful examination, but although vaccination modifies the disease it does not alter it

The *method of vaccination* at present is by one insertion, a single linear scratch one-quarter of an inch long in the long axis of the limb. When maximum protection is desired or circumstances make it particularly desirable to avoid risk of failure, e.g., in face of variola major, the number of insertions may be increased to four, spaced so as to avoid coalescence. This procedure was adopted in the Glasgow outbreak (Macgregor and Peters, 1942). The method of vaccination by acupuncture, as practised in the American Army, has much to commend it.

TYPHUS—Precautions have been taken against the entry and spread of this dread disease in the British Isles, by the formation in the great cities and ports of trained, mobile anti-typhus teams, immunized and provided with protective clothing. Control depends upon the control of head or body lice infected with *Rickettsia prowazeki*, the isolation of patients and contacts, delousing and disinfection of the premises of patients and contacts. The watchword is "No lice—no typhus", and an active campaign against lousiness was initiated in 1941.

In this country the treatment recommended for head lice is lethane hair oil (Busvine and Buxton, 1942) which is simple to apply, efficient, and available in adequate supply. Even more effective is *dichloro-diphenyl-trichloroethane* (D.D.T.), which was adopted by the American Army as the standard anti-louse powder in May 1943, not only is it lethal to lice, but it is also louse-repellent and persistent in its action. The powder is applied by power-dusters when clothing is loosened but not removed, and one application of the powder remains effective for three to four weeks, unless removed by washing; it is also possible to impregnate underwear with D.D.T. The remarkable value of D.D.T. has recently been proved in Naples, and its future possibilities have not yet been fully investigated. Present production is all earmarked for the armed Forces, for use only as an anti-louse powder.

Sufficient data have now been accumulated from the Middle East to confirm the value, as an added protection against infection, of *anti-typhus vaccine*, consisting of a 5 to 10 per cent killed suspension of *R. prowazeki* grown in the yolk sac of the developing egg, and administered in three weekly doses of 1 c.c. each.

LABORATORY SERVICES

Since 1939 there has been a great extension of public health laboratories, and facilities are now provided in many parts of the country where formerly they were non-existent and reliance had to be placed on an impersonal postal service. The Emergency Public Health Laboratory Service, Medical Research Council, with which are associated the bacteriological laboratories of the universities and many of the already existing public health laboratories, provides a linked, coordinated service, able to conduct every kind of investigation associated with the diagnosis and prevention of spread of infective disease. The improvements in laboratory technique and diagnostic methods in recent years have been remarkable, especially in the isolation and fuller identification of pathogenic bacteria from both the intestinal and respiratory tracts. No longer is it thought necessary merely to report the absence of diphtheria organisms in a nasal or throat swab, but the presence of other pathogenic organisms is sought for, e.g., hæmolytic streptococci, pneumococci, influenza bacilli or the organisms of Vincent's angina, and their presence

and abundance reported, so that by the combination of bacteriological report and clinical picture the practitioner may be the better enabled to diagnose the condition and give suitable treatment. Personal contact between the practitioner and bacteriologist is welcomed and encouraged, in order that problems of mutual interest may be discussed, the significance of new tests clarified and the advisability of carrying out further tests explored. Cooperation between practitioner, bacteriologist and public health authority is increasing to a degree that augurs well for the future of preventive medicine in this country.

CONCLUSION

Whilst the prevention and control of intestinal infections is still one of the main objectives of preventive medicine, there is now a re-awakened interest in the control of infections having the upper respiratory tract as portal of entry. Reduction of air-borne infection, by preventing the dissemination of infected dust and by the use of aerial disinfectants and the oiling of floors and bed linen, has been found most effective in controlling spread of infection by dust in hospitals. Aerial disinfectants, bactericidal mists, and ultra-violet light in hospitals, operating theatres and schools, have shown considerable promise and may have a still wider application in the future.

So far as infective disease is concerned, curative and preventive medicine are interdependent, and education is playing an increasingly important part in prevention and control—education of the public to higher standards of personal and public hygiene, beginning in the nursery and nursery school and continuing in the elementary and senior schools, education of the expectant mother and those who are already parents, education of teachers and health visitors to pass on knowledge and advice, education of nurses to understand the rationale of the technique practised in hospitals to prevent spread of infection and, finally, education of the medical profession by the provision of more preventive medicine in a reorganized curriculum, and refresher courses for those already in practice.

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PSYCHOLOGICAL MEDICINE

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RECENT advances in psychological medicine have been in the main of an eminently practical kind, in that they have been concerned with types of treatment that have produced results which have exceeded anything that appeared possible only a few years ago.

In order of their introduction, the principal new therapeutic measures have been the insulin coma treatment of schizophrenia, the treatment of manic-depressive and schizophrenic psychoses by convulsions induced nowadays by electricity, and, for a number of chronic mental afflictions, pre-frontal leucotomy or bilateral section of the fronto-thalamic tracts. These are the more outstanding advances in treatment, but there have also been others of a less drastic, but nevertheless useful, kind.

For fifteen years or more following the last war, the principal interest had been in psychological methods of treatment. These are still the most universally helpful, but in the psychological field there have been no such outstanding advances as those just enumerated, which are physical in nature and conception. No doubt there is the usual tendency to expect too much in too many directions of the newer methods, but this is natural in a period of experiment, and the scope of each is gradually being more clearly defined.

INSULIN COMA THERAPY

As regards the insulin coma method, its use has been almost confined to patients with schizophrenia. The essential technique consists in the injection, six days out of seven, of increasing amounts of insulin until a dose has been reached which produces coma, which is allowed to continue for one-and-a-half hours, at the end of which time the patient is revived by feeding him through a nasal tube with a sugar solution. The coma dose is reached only gradually and once reached the dose is repeated until as many as sixty comas have been produced. This is usually considered to be the limit, beyond which benefit cannot be expected, and a shorter course may be enough. The method, it is claimed, is especially beneficial in paranoid types of schizophrenia, in catatonic and hebephrenic types it is considered to be less successful.

There is no doubt that the method shortens the course of the illness in many cases, and it is claimed that the quality of the remission is better. The immediate results, however, are better than the final, a proportion of those who improve or recover may relapse later. Emphasis has always been laid on the importance of treating the patient as early as possible, and nowadays the difference in the results claimed by different workers is apt to be attributed to differences in technique and skill. A careful and critical scrutiny of the literature, however, shows

fact the efficacy of the insulin coma method in curing schizophrenic patients who would not have recovered with more conservative methods, is difficult to define precisely. Nevertheless, where the method is available (and the war has much restricted facilities for it) it is desirable to make a rule of giving the patient the opportunity of insulin treatment. An earlier recovery is, after all, no mean benefit.

On the other hand, the method has its dangers and requires experienced medical and nursing care. The mortality rate is small but not negligible. As has usually happened in the history of new methods of medical treatment, the earlier claims have had to be considerably watered down. Complete remission was at one time claimed in at least 70 per cent of early cases (if they were treated within the first six months). As is so often the case with medical statistics, controls were not considered, and there is evidence in some equally early cases treated by conservative methods that the recovery rate can be almost as good. Anyone who has seen much of schizophrenic patients who do not reach mental hospitals, as well of those who do, cannot forget the remarkable "spontaneous" recoveries that occur. It also is extremely probable that all the statistics are vitiated by the frequent difficulty in differential diagnosis between schizophrenic and manic-depressive reactions.

Most people are agreed that to ensure the best results the insulin method should be combined with psychological, occupational, recreational and other standard methods of treatment, and it is always necessary to advise the recovered patient on the best arrangements he can make for living conditions—as to environment—so that he will be subjected to as few avoidable stresses as life permits.

CONVULSION THERAPY

There is much more certainty about the effects of the convulsion method of treatment. Formerly the convulsion was produced by the intravenous injection of cardiazol, but the electrical method, applied by means of one of a number of similar apparatuses produced by different manufacturers, is much more convenient, immediate, and less of an ordeal for the patient. It is also less likely to produce fracture of a long bone or of a vertebra, which may, however, still occur during the convulsive seizure, but practically never with any serious clinical sequelae.

The treatment is at first sight a strange one, since it consists in inducing in the patient a series of six to twenty convulsions, at intervals ranging from a day to one week. Originally it was introduced for the treatment of schizophrenia, on the basis of the observation (not now thought to be correct) that schizophrenia and epilepsy were biological antagonists. Hence the argument, "let us give the schizophrenic epilepsy, and we may cure the schizophrenic process." In spite of the probable falsity of the original reasoning, the method has worked, in so far as many schizophrenic illnesses are modified and some are terminated by convulsion therapy. As with insulin, the original claims were probably pitched too high as regards schizophrenic illnesses. There is a prevalent opinion that insulin is more effective in schizophrenia, but some good observers do not agree and think that electrical convulsion therapy, properly used, is equally efficacious.

The *technique*, in broad outlines, consists in sending an alternating current of

50 to 150 volts for one-tenth of a second or more through the patient's head between two electrodes placed on either side in the fronto-parietal areas, the patient becomes unconscious at once, without the unpleasant preliminary anxiety that follows the injection of cardiazol. Afterwards the patient is dazed and confused for a short time and there is apt to be an effect on memory, especially a difficulty in recalling names. This effect on memory persists for some weeks, or, rarely, for months. It is an indication of temporary damage to the brain cells and, although there is no measurable permanent effect, caution should be used in prescribing his method of treatment, at least in young people who may recover with the use of less drastic methods. However, its use in conditions which would otherwise make a spontaneous recovery with time is often justified on account of the amount of suffering and actual dangers which the patient may have to undergo during prolonged mental illness.

The voltage and the time have to be adjusted empirically for each patient to give the necessary major convulsive effect. Minor effects short of producing a convulsion are apt to be not only ineffectual but possibly harmful. To prevent fracture, some workers enforce complete restraint of all the limbs and trunk by means of a restraining jacket, but many prefer to use no restraint at all, other than that required to prevent the patient from rolling off the table. A pillow placed so as to hyper-extend the spine helps to prevent fractures of the vertebrae.

Results —The most striking thing about electrical convulsion therapy, however, is that it is far more effective in conditions which were not at first considered at all in connexion with this method, and which are believed to have a quite different pathology from that of schizophrenia. It is in depressions of the constitutional type and in those occurring at the involutional period of life that by far the most satisfactory results of convulsion therapy are obtained.

In involutional depression (involutional melancholia) the recovery rate by this method is at least 70 per cent, and probably is actually higher. Moreover, this is an illness which commonly lasts months or even years and which formerly had to be cared for along general lines by ensuring that the patient's sleep and nourishment were maintained, so far as possible, and suicide prevented. Now it is not uncommon with electrical convulsion therapy to see such patients cured in a few weeks, whilst relapses seem to be rare.

With depressions of the constitutional or manic-depressive type occurring at younger ages, electrical convulsion therapy is effective in the great majority of cases. When relapses occur a second course is usually effective. It also cuts short manic excitements, when there is much anxiety accompanying the depression results are less good.

It is hoped that some less violent but equally effective method of treating these common mental ailments will soon emerge. In the meantime, however, electrical convulsion therapy has provided a remarkable change, especially in the treatment of depressive illnesses, particularly so far as duration is concerned.

LEUCOTOMY

This is the most drastic of all the newer methods but it is the one that has the most logical basis. It has long been known that individuals whose frontal lobes

are damaged, are apt to undergo a change in temperament in the direction of greater cheerfulness and insouciance. It had also been observed that monkeys with bilateral pre-frontal lesions of the frontal lobes underwent a change in temperament. Moniz of Lisbon was bold enough to apply these discoveries to human beings in the hope of producing effects in chronic mental disease by dividing the associative paths between the thalamus and the frontal cortex. It is evidently the fibres passing between the frontal cortex and the dorso-medial nucleus of the thalamus that are of principal importance in this respect.

The method has had most success in chronic agitated impulsive schizophrenics, who under its influence became at least manageable, and in chronic depressions with obsessional thinking. In involutional melancholia, after the failure of electrical convulsion therapy, it sometimes produces great improvement. The main drawback is that there is apt to be at least some deterioration in the personality, although this may be hardly perceptible.

VITAMIN B THERAPY

The relation that the vitamin B complex and its various constituents bears to the nutrition of the nervous system has naturally led to its employment in mental states when the basic pathology is a physical affection of the brain. Thus, the *confusion of senile patients* may respond to the use of nicotinic acid (1,000 mgm daily in ten divided doses, hourly during the day). It is recommended that brewer's yeast, 15 to 30 mgm daily, should be added to avoid precipitating latent deficiencies in other B factors. When the confusional symptoms have subsided, a maintenance dose of 25 to 30 mgm nicotinic acid is advised for a prolonged period.

In *delirium tremens* it has been claimed that vitamin B, given intravenously, is of much value. The dosage recommended is high, 50 to 100 mgm of thiamin, intravenously, three times in twenty-four hours.

PSYCHOTHERAPY

As regards psychological methods of treatment there has been a tendency, arising from the exigencies of war, for some workers to employ briefer methods of treatment than they have hitherto used. In particular much recourse has been made to *narco-analysis* as it has come to be called. This implies the intravenous injection of a barbiturate, such as evipan (10 per cent solution), pentothal (10 per cent), or nembutal (2½ per cent) to produce a mild degree of narcosis, during which the patient tends to become more communicative. Whether it usually allows him to divulge anything of which he was hitherto not completely aware is somewhat dubious, but for various reasons it may enable him to disclose what he has previously withheld. The most common field for its employment is that of the psychogenic amnesias. There are few amnesias recoverable in this way which cannot be removed by persuasion alone, but in some instances the method of narcosis saves time.

ELECTRO-ENCEPHALOGRAPHY

Diagnostic technique has been enlarged by the application of the electro-encephalogram to psychiatric problems. Some of the chronic behaviour disorders of children have had light thrown on them by this means. An abnormal electro-encephalogram has been found in a significant proportion of adolescent psychopaths and also in a larger proportion of psychoneurotics than among the ordinary population. Such findings should not lead to a one-sided interpretation of the facts, the psychological environment and developmental factors continue to be of predominating importance in most cases.

INTELLIGENCE TESTS

The war has fostered an unusual amount of work on intelligence tests and the assessment of temperament. Intelligence tests have been applied mainly to large groups and the tests that have been most successful for the purpose have been of the non-verbal kind, depending less upon scholastic education and more upon natural ability than the traditional type of intelligence test. Conversely, with the use of such tests it is essential to learn what degree and kind of intelligence is required for different kinds of task. This means that ideally a "job analysis" of every kind of work should be done (a task commonly carried out by psychologists), so as to determine not only the limits of intelligence required, but the kind of intelligence or skill (mechanical, mental) that is necessary, as well as the temperamental qualities, so far as these can be defined.

ASSESSMENT OF TEMPERAMENT

This remains a difficult task. A combination of psychiatric interview and observation of the individual over a period of several days by a skilled observer living in the same environment seems to be the most effective method, as has been shown in the Army.

As an adjuvant to the psychiatric interview, various methods of eliciting the candidate's inner trend of thought and feeling have been used, and of these the Rorschach test and the "thematic apperception" test (which consists of a series of dramatic pictures) have been the most generally employed. Both depend on getting the candidate to give proof of the mental associations that are aroused in his mind by the material presented to him.

By these means it has been possible to utilize manpower in the Services more effectively than would have been possible without such methods. The results are seen not only in greater efficiency but in greater contentment. At the same time it would not do to give the impression that these are as yet matters of great precision. It is not, for example, a matter of reading off an intelligence score and concluding that so-and-so should go to a particular type of job. Special abilities, interests, temperament, physique and the like, should all be taken into account.

ENDOCRINOLOGY

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IN recent years a considerable change has been discernible in the approach to clinical endocrinology. During the early phases of development in this comparatively new branch of medicine enthusiasm often outran prudence. Theories based on inadequate evidence led to therapeutics which were little better than homœopathic magic, whilst a glut of extracts for this "organotherapy" appeared on the market. Such extracts rarely had measurable physiological effect in man, indeed, for some years thyroid substance alone was probably the only ingredient which was active. Thus little harm resulted, whilst many cures were no doubt achieved by simple suggestion. Physiological and biochemical research has now placed substances of great potency in the hands of the medical practitioner, with the result that a more critical attitude of mind has become necessary. The very number of such substances is confusing to those who are unable to follow closely the extensive literature, and it is regrettable that commercial firms add still further confusion by giving to pure chemicals names of their own. Three of the points that seem to require clear thinking may be mentioned —

First, patients are naturally concerned with their own symptoms, for which they require an explanation and treatment. It is only too easy to blame "the glands" for what are often psychological disturbances. Because lassitude, obesity and impotence may be symptoms of adrenal, thyroid or sex gland deficiency, there is no justification for symptomatic therapeutics. It should be remembered that, apart from thyrotoxicosis, diabetes mellitus and sex gland deficiency in women, demonstrable disease of the endocrine glands is uncommon.

Secondly, "species difference" in physiological response is now well recognized. New experimental work in small laboratory animals should be applied to human disease with caution until confirmation comes from experimental observations on man himself.

Thirdly, it should be recognized that clinical examination at the bedside is less informative in endocrine disease than in any other branch of medicine. More and more is it becoming necessary to regard each individual patient as a problem in experimental physiology and to rely for the elucidation of this problem on laboratory techniques which are often of considerable complexity.

PITUITARY

The therapeutic uses of anterior pituitary extracts remain disappointing. Favourable reports appear from time to time on the treatment of certain forms of *dwarfism* by growth principle, but in many cases results are negative.

The physiology of *lactation* is complex, and the first enthusiasm for the beneficial

effects of lactogenic extracts has not been maintained. Suckling appears to be by far the strongest stimulus once lactation is established, thus making it difficult to assess results. Corticotrophic extract is now available, and early reports suggest that it may be of value in cases with adrenal deficiency of pituitary origin (Hemphill and Reiss, 1944).

The various principles involved in the control of *carbohydrate metabolism* do not appear to be of value in treatment at present. Thyrotrophic and gonadotrophic extracts are dealt with under the appropriate end-organ.

The work of Sheehan and others suggests that minor degrees of pituitary adequacy may not infrequently follow low blood pressure during labour, although the difficulty of establishing the diagnosis of pituitary deficiency, in the absence of an obvious local lesion, remains.

Anorexia nervosa is now thought by many authorities to be a form of functional pituitary deficiency and, so far as thyroid and sex gland function are concerned, may be identical with Simmonds's disease. Cases of *anorexia nervosa*, however, have not shown the disordered electrolyte metabolism and low urinary 17-ketosteroids, indicating secondary adrenal deficiency, found in some cases with known organic lesions of the anterior pituitary (Fraser and Smith, 1941).

There is little new to report on the treatment of those rare diseases, *acromegaly* and *Cushing's syndrome*, which are associated with over-function of the gland. The production of complete thyroid deficiency (now possible without surgical aid) has been suggested for the alleviation of diabetes insipidus (Blotner and Cutler, 1941), which can, however, be simply controlled by posterior lobe extracts.

The problems of *obesity* remain unsolved. Unfortunately most patients and not a few clinicians are only too willing to accept an endocrine etiology for the results of heredity or excessive carbohydrate intake. The universal administration of thyroid cannot be deprecated too strongly, and this substance is best reserved for special circumstances, such as hypothyroidism and water-salt retention. Dietary control is the main, though hard, way to success. Reports indicate that benzedrine (amphetamine sulphate) is sometimes helpful, especially in children (Bronstein, Galpern and Brown, 1942; Bruch and Waters, 1942).

THYROID

The work of Astwood on the action of goitrogenic substances represents not only a brilliant therapeutic advance, but a possible discovery of physiological principles which may have far-reaching effects. At the present time *2-thiouracil* and allied substances are thought to prevent the cells of the thyroid epithelium forming the thyroid hormone. This results first in depriving the rest of the body, after some days, of the metabolic and other actions of thyroid hormone, and, secondly, in the production of a goitre with histological stimulation of the thyroid epithelium. It was somewhat optimistically stated originally that thiouracil was not goitrogenic in man. It has been shown at Hammersmith that this is not the case, and that the histological evidence of stimulation in the normal human thyroid after thiouracil is similar to that found in the experimental animal. Thus histological stimulation in the absence of physiological secretion is thought to be due to

increased thyrotrophic activity of the anterior pituitary resulting from diminution or absence of circulating thyroid hormone

Thyrototoxicosis—Clinical reports on the treatment of thyrototoxicosis with thiouracil, 2-thiouracil and methyl-2-thiouracil have been favourable in America (Astwood, 1943, Williams and Bissell, 1943) and in this country (Himsworth, 1943). A usual dose of thiouracil is 0.2 gm five times a day (= 1 gm a day) for some weeks, followed by a decrease in dosage, 2 gm a day have been given for long periods without ill-effect. The results may be followed by observing changes in weight, heart rate, basal metabolic rate, serum cholesterol, blood iodine, urinary creatine and, at low metabolism levels, the electrocardiogram. Himsworth stresses several important points—

- (1) Iodine should not be given before or during treatment with thiouracil, as it appears to interfere with its action
- (2) Dosage should be reduced as soon as possible in view of toxic effects
- (3) Patients will not necessarily relapse when dosage is reduced, or even stopped

Apart from rashes, nausea and unpleasant breath with thiourea, the main toxic effect is agranulocytosis. Figures are not yet available, but it is probable that this risk is small. Unfortunately, it is liable to occur suddenly, and serial white cell counts may give no warning. Opinion is divided as to how far these substances should be used therapeutically when hospital and laboratory facilities are not available. In the very worst cases, such as those with congestive heart failure, in which no surgeon would operate, it seems unfair to withhold what may prove to be a life-saving treatment. Some caution, however, might be shown in milder cases of thyrototoxicosis. Reports of failure of the drug should be examined critically, as wrong diagnosis, previous iodine therapy and inadequate dosage are the usual causes.

In those rare cases in which exophthalmos is prominent and thyrototoxicosis minimal, thiouracil is probably contraindicated, owing to the risk of progressive exophthalmos. Deep X-rays to the pituitary may be tried. Other non-surgical methods of treatment in thyrototoxicosis have been somewhat overshadowed by these recent discoveries. Radio-active iodine was promising, but is not available in this country in war time. Deep X-rays have their advocates, but the general impression is disappointing—the evidence is unfavourable to massive oestrogenic therapy. How far thiouracil and allied substances will replace surgery is uncertain, and for a time there is likely to be a good deal of bias in individual opinion. Surgery will still be needed for compression symptoms.

Thyroid deficiency—The clinical recognition of myxœdema is simple, but lesser grades of thyroid deficiency are more difficult to demonstrate. It has been found at Hammersmith that in complete thyroid deficiency the electrocardiogram always shows flat or inverted T waves and there is no response to injected thyrotrophic extract (Sharpey-Schafer and Schrire, 1939), basal metabolic rate, serum cholesterol and other measurements, although of great value as confirmatory data, are not so constant. Partial deficiency is demonstrated when there is a response to thyrotrophic extract in the presence of clear-cut evidence of thyroid lack. Such evidence includes smaller changes in the electrocardiogram, basal metabolic rate, blood cholesterol and urinary creatine, which can be restored to normal by stimula-

tion with thyrotrophic extract or substitution thyroid therapy. Undue sensitivity to cold is the most constant symptom in cases of partial thyroid deficiency. Obesity is rarely present, indeed, patients may be underweight. Hair and skin may be normal or show only slight changes. Abdominal pain is a not infrequent symptom of thyroid deficiency (Hamilton *et al*, 1941, Moehlig, 1941), and many patients have undergone unnecessary laparotomies. In young children "cretinism" is best detected by the low voltage electrocardiogram, immature bone age and high blood cholesterol. The electrocardiogram of thyroid deficiency may be distinguished from that of myocardial infarction by the behaviour of the T waves after potassium salts by mouth. In the former they become upright and in the latter further inverted (Sharpey-Schafer, 1944).

SEX GLANDS

The extensive literature on the clinical use of the sex hormones is full of conflicting reports, and the number of conditions in which these hormones have been used is now considerable. Some attempt may be made, however, to indicate what type of result may be expected in certain clinical states. Such a classification is largely a matter of personal opinion and does not suggest that treatment should not be tried, even if the expected result is doubtful.

(A) GOOD RESULTS IN MOST CASES

- (1) Androgens in sex gland deficiency in the male
- (2) Œstrogens in sex gland deficiency in the female
- (3) Massive œstrogens in satyriasm in the male

(B) GOOD RESULTS IN A FEW CASES

- (1) Chorionic gonadotrophins and androgens in cryptorchidism
- (2) Equine gonadotrophins in anovulatory cycles
- (3) Androgens in "the male climacteric"
- (4) Œstrogens in dysmenorrhœa
- (5) Œstrogens in pre-menstrual headache and migraine
- (6) Massive œstrogens in prostatic carcinoma
- (7) Œstrogens in the inhibition of lactation

(C) DOUBTFUL OR NO RESULTS

- (1) Gonadotrophins in seminal inadequacy
- (2) Androgens in any disease of women
- (3) Androgens or œstrogens in benign prostatic hypertrophy
- (4) Progesterone in habitual abortion
- (5) Œstrogens in acne vulgaris
- (6) Œstrogens in induction of abortion and labour

Dosage and routes of administration—It has been suggested by Lapin *et al* (1943) that a total dose of 6000 I U. of chorionic gonadotrophin should not be exceeded in the treatment of cryptorchidism, in view of the production of anti-gonadotrophins. Equine gonadotrophin (from pregnant mare's serum and mainly follicle-stimulating) is probably most effective by the intravenous route. The dose for man

is unknown but should be as large as possible. The pioneer work of Dodds and his colleagues has made available a number of cheap oestrogenic substances which are potent when given by mouth. A usual initial dose of diethylstilboestrol would be 1 or more mgm a day until symptoms of sex gland deficiency are controlled, followed by a maintenance dose which should be as small as possible. If the maintenance dose is small enough, nausea and uterine bleeding may be avoided. If there is vomiting, the natural oestrogens or one of the other synthetic compounds may be tried.

Oestrogens can also be administered by implantation of tablets, sub-lingually and intravaginally, 10 mgm a day or more of stilboestrol probably depress some pituitary functions. Treatment with androgens may be started with intramuscular testosterone propionate, at least 25 mgm three times a week, until the desired physiological effect is obtained. Implanted tablets, or methyl testosterone orally, may then be used for maintenance.

Some problems in sex hormone therapy—The immature male with doubtful gonadal deficiency frequently causes difficulty to the practitioner when advising anxious parents. Authorities now agree that a conservative attitude is often the best. Retracted testes may be mistaken for cryptorchidism, and in obese boys the genitals erroneously considered underdeveloped. Delayed puberty may require treatment more for psychological than for physiological reasons.

Testicular biopsy seems an essential investigation in the diagnosis of sterility in the male. If spermatogenesis is abnormal it may be rational to try treatment with a follicle-stimulating gonadotrophin. Unfortunately the results are poor. Impotence is nearly always due to a psychoneurosis if the gonads appear normal. If androgens are used to help psychotherapy, it should be remembered that large doses (100 mgm or more testosterone propionate a day) are needed to produce spontaneous erections in most normal men, and there is a risk of damage to spermatogenesis with such doses. In women the masculinizing effects of androgens must be weighed against possible symptomatic benefit (Hamblen, 1942). Homosexuality is not affected by the sex hormones, except in certain rare diseases.

ADRENAL

The physiology of the adrenal gland is still somewhat confused, and clinical application of experimental work has necessarily to proceed with caution. Acute adrenal deficiency, such as the Waterhouse-Friderichsen syndrome, is usually only discovered at autopsy, and it is uncertain how frequently lesser degrees of acute deficiency occur. Cortical extracts have been thought to be beneficial in burns toxæmia, but in general they have proved disappointing in so-called "traumatic shock." In acute cases showing potassium retention and increased sodium chloride excretion in the urine, it would be rational, however, to use them. Evidence of chronic deficiency may be obtained from the blood biochemical picture, the results of a low sodium chloride high potassium intake, and reduced urinary 17-keto-steroids. If desoxycorticosterone acetate (DCA) is used in treatment, each patient needs careful balancing against his sodium chloride intake. Cortical extract is probably best reserved for emergencies. Death may occur, not only from

"Addisonian crisis" but from hypoglycæmia, and extra glucose may be necessary on occasions. There is a very real risk of over-treatment with DCA, death probably resulting from congestive heart failure. Extensive œdema and a cardio-thoracic index over 0.5 are warning signs. Implanted tablets of DCA have been used successfully, but the same risks are present (Engel *et al*, 1942). Crystalline corticosterone is now available, and clinicians await further work with this substance with interest, since it appears to govern carbohydrate and other functions of the adrenal cortex.

The adreno-genital syndrome —By far the greater majority of hirsute women are not suffering from any demonstrable or treatable endocrine disease. If a familial or racial history of the trouble can be obtained, it is rarely worth while asking a patient to undergo elaborate investigations. Grossly increased 17-ketosteroid or androgen excretion favours a tumour which may be successfully dealt with by surgery, but there is a good deal of disagreement on the benefit of partial adrenalectomy for "adrenal hyperplasia". When the evidence points to the anterior pituitary as the primary lesion, deep X-rays may be tried. Fame awaits the individual who discovers a really effective local treatment for distressing hirsutism. The razor remains the best substitute and the patient should be warned of the dangers of other depilatories, such as X-rays. Estrogens, by mouth or locally as an ointment, sometimes seem to affect the growth of hair.

CARBOHYDRATE METABOLISM

It is now recognized that *diabetes mellitus* is not a single disease but a syndrome of multiple and largely unknown etiology. The treatment of insulin-sensitive severe diabetes has undergone only a few modifications in recent years. It is generally agreed that these diabetics need and use adequate quantities of carbohydrate and that the high blood sugar represents a compensatory mechanism. Patients are now balanced on normal diets containing a normal or increased carbohydrate content, and less attention is paid to the presence of small amounts of sugar in the urine. The introduction of the long-acting zinc protamine and globin insulins has been of considerable advantage to the patient. The main risk of these substances is the insidious production of a state of chronic hypoglycæmia.

Diabetic coma remains a serious problem. Collen (1943) found that the mortality was over 80 per cent when the patient was unrousable or if coma had lasted more than twelve hours. Even if the biochemical changes are largely restored to normal by treatment, the blood pressure may remain low and the patient die. Work at Hammersmith has indicated that this low blood pressure results from arteriolar dilatation rather than from diminished cardiac output. There is therefore no purpose in trying to increase the diminished blood volume, indeed, there is little doubt that many cases of diabetic coma are drowned by the large quantities of intravenous fluids given. In the worst cases it is probably best to try treatment with massive doses of insulin (many hundreds of units) and to keep intravenous glucose-saline or alkalis at a minimum.

The elderly mild diabetic is little understood, but many do well if left untreated. Some of these patients can be shown to be insulin-resistant and will of course

nursery affords to the busy housewife, who is entitled to some respite for a certain period each day for relaxation and recreation

Many mothers during the war have experienced temporary freedom from domestic responsibilities, and when peace returns a considerable number will undoubtedly demand a continuance of at least some partial relief, commensurate with the standard of life enjoyed by other sections of the community. The living conditions and happiness of the people will be, it is hoped, the first consideration of national policy. If local authorities do not anticipate and meet this demand, commercial enterprise will undoubtedly step in and provide, as was already evident before the war in many of the larger stores, some form of child care to allow the mothers to do their shopping, and these facilities may even be provided in cinemas and other places of entertainment. The result will be that many of the advantages which can be derived from a properly organized nursery with a skilled staff will be lost if these pseudo-nurseries are staffed by untrained or incompetent personnel.

The opponents to the policy of nurseries can be divided into two groups. One opposes any child under the age of two years being allowed away from its mother—my own welfare authority has accepted the view that nursery facilities should be limited to children between the ages of two and five years. The other group strenuously opposes nurseries on the principle that the only place for a child up to the age when it can attend school is the home under the mother's constant care. This group contends that community care inculcates the herd instinct, which destroys individuality and initiative.

A further, and the strongest, argument against collective care is the increased liability to certain infective diseases at a time when the mortality rates are much higher, particularly from diseases like whooping-cough and measles.

These are the relevant arguments in the controversy, but they will have little effect on the national action until such time as hostilities cease and opportunity again offers itself for a possible revision of policy. It is, however, necessary that the problem should be considered now, and an examination made of the difficulties encountered and the decisions made by welfare authorities in the establishment of day and residential nurseries.

In December, 1941, the Ministry of Health and the Board of Education empowered local authorities to set up two groups of nurseries, namely, part-time and full-time, or residential nurseries. As such provision was outside the normal activities of most welfare authorities the government agreed that a 100 per cent. grant should be available for the setting-up and running costs. Voluntary organizations were thus discouraged by lack of funds from participating in the scheme, although their help was welcomed by many authorities in augmenting the permanent paid staff.

SITING AND ESTABLISHMENT OF DAY NURSERIES

The first step taken was to obtain a reliable estimate of the demand, based on the number of women who were ready to undertake work in war industry if facilities could be provided for looking after their young children. Appeals through the local press requesting women to intimate whether or not they were prepared to carry out war work should a nursery be established were of little avail. The mo-

reliable information was obtained from the local Ministry of Labour office by the submission of a list of names of women prepared to undertake this work. These women were then interviewed by the health visitors, and all the relevant facts obtained.

After ascertaining the demand, the next problem which confronted the authority was the *siting* of the nursery, and here one of three possibilities had to be considered. First, whether the nursery should be sited in the particular area of the women's homes, secondly, whether it should be situated *en route* to the war factory; and, thirdly, whether it should be in close proximity to, or within the precincts of, the factory itself.

The advantage from the health aspect of having the nursery in or near the housing area is that the children can be taken to the nursery without having to travel in bus or tram, thereby reducing the liability to infection, and further, should the child show signs of illness during the day, it is easier to communicate with friends or neighbours and thus allow the child to return to its home.

Siting the nursery *en route* to the factory has the disadvantage of a broken journey, which increases the fatigue and difficulty of transport for the mother and children, whereas if the nursery is sited close to, or within, the factory area, particularly in vulnerable towns, it has the obvious risk of bringing the children into what might be termed a "target area." In a district with many small, scattered factories, it will probably be found difficult to find sufficient women with children under five years of age to justify a nursery limited to one particular factory.

Weighing up all these considerations, my own welfare authority decided that it was preferable, so far as possible, to site the nurseries in the dormitory districts.

The next problem which confronted the authority was to find *suitable premises*, and this was extremely difficult in a town which had suffered extensive damage by enemy action, as most of the remaining undamaged halls had already been requisitioned as rest centres, billets, or military establishments. In peace time, when buildings can be built specifically for the purpose, the open-air principle with large glass windows opening on to verandahs, ample garden and surrounding open space, and effective cooking and bathing arrangements, would naturally be advocated. In the present case some of these amenities had to be discarded as local circumstances made it impracticable to find such ideal premises.

The first nursery was opened in a villa which had, before the war, been occupied by the medical superintendent as a residence in the grounds of the municipal hospital. This, fortunately, adjoined a municipal housing estate, a district in which many of the women lived who worked in factories. The second nursery was established in a house which had previously been used as a nursing home, but which had been requisitioned as a rest hostel by the Public Assistance Committee. The third and fourth nurseries were established respectively in the woodwork department of a secondary school, and in the sports pavilion of a university college, both these establishments being close to large housing estates.

The *accommodation requirements* of a nursery depend on the ages of the children attending, and on the number. A nursery catering for children from an early age of infancy to five years is normally divided into three age-groups. The child under one year needs absolute peace and quiet. The "tweeny" between one and two

of iron are required according to the age of the child, and as many of the natural sources of iron intake, such as first-class proteins, are rationed, the possible deficiency is corrected by giving as a routine prophylactic 3 grains of ferrous sulphate daily in tablet form

As at least one gramme of calcium is required daily, and as there was the fear of foods like fish, vegetables and dairy products being in short supply, the government decided to fortify bread with calcium and vitamin B₁, and as the children receive at least one pint of milk each day there is little chance of deficiency in this essential mineral

A recent experiment carried out in a nursery school showed that children who received a supplementary supply of calcium lactate increased in weight and height to a greater extent than a control group

TABLE I
FINDINGS ON MEDICAL INSPECTION SOON AFTER ADMISSION TO NURSERY

	Age 2+	Age 3+	Age 4+	Totals
<i>Number examined —</i>				
Boys	56	34	16	106
Girls	28	24	11	63
Total	84	58	27	169
<i>Defects requiring treatment —</i>				
Squint	—	1	—	1
Enlarged tonsils	3	6	—	9
Adenoids	2	4	—	6
Enlarged cervical glands	1	1	—	2
Defective hearing	1	—	—	1
Otorrhœa	1	—	—	1
Bronchitis	4	1	2	7
Flat feet	3	1	—	4
Knock-knee	5	2	—	7
Debility	2	—	—	2
Anæmia	—	1	—	1
Phimosis	2	—	—	2
Septic spots	3	—	—	3
Enuresis	3	—	—	3
<i>Defects for observation —</i>				
Enlarged tonsils	44	24	14	82
Adenoids	36	20	12	68
Enlarged cervical glands	39	26	18	83
Heart murmurs	2	—	—	2
Bronchitis	2	1	—	3
Knock-knee	18	24	8	50
Bow-leg	19	12	5	36
Flat feet	3	1	—	4
Phimosis	3	2	2	7
Debility	20	14	11	45
<i>Nutrition —</i>				
Excellent	11	13	2	26
Normal	53	33	13	99
Fair	20	12	12	44
Bad	—	—	—	—
Total	84	58	27	169

TABLE 2
INCIDENCE OF COMMUNICABLE DISEASES IN WAR-TIME NURSERIES

Nursery	Measles		Scarlet fever		Tonsillitis		Whooping-cough		Chicken-pox		Rubella		Mumps		Scabies		Impetigo		Nits	
<i>Northlands</i>																				
April 1, 1942-March 31, 1943	13		-		3		14		1		-		12		1		1		3	
April 1, 1943-March 31, 1944	10		3		2		-		16		-		1		-		-		3	
<i>Swaythling</i>																				
April 1, 1942-March 31, 1943	3		-		-		1		1		-		-		-		-		-	
April 1, 1943-March 31, 1944	5		-		-		9		3		-		1		2		2		-	
<i>Borough Hospital</i>																				
April 1, 1942-March 31, 1943	-		-		-		5		-		-		-		-		-		-	
April 1, 1943-March 31, 1944	4		-		-		-		1		-		-		3		-		-	
<i>Itchen</i>																				
April 1, 1942-March 31, 1943	2		-		1		3		1		-		7		1		1		3	
April 1, 1943-March 31, 1944	9		-		-		2		2		-		-		-		3		-	

Milk, of course, forms an important part of the dietary. At least one pint of milk for each child is allowed. This is in addition to the milk the child might receive at home. The milk supplied to nurseries should be pasteurized. In areas where pasteurization facilities are not available, one of the graded milks should be served, failing which ordinary raw milk should be boiled before use. One-third of a pint should be given for breakfast, one-third used for milk puddings and custards, and the remaining third given during the afternoon.

MEDICAL SUPERVISION

As the nurseries are under the direct control of the Public Health Department, it is the general practice to arrange for one of the assistant medical officers of health to carry out a routine medical inspection at monthly intervals, and in table 1 the principal defects found amongst a group of 169 children shortly after admission are shown.

Enlarged tonsils and adenoids were the main defects requiring attention and observation, and enlarged cervical glands, knock-knee and bow-leg were conditions high in the list of those requiring observation. The nutritional findings are so variable and so dependent on the medical officer's standard that it is difficult comment on the difference between normal and fair.

Outbreaks of infective diseases are the main anxiety of day nurseries. Every effort is made to protect the children against diphtheria by stressing the value of immunization, with the result that at least 95 per cent of children are protected before admission. No local case has yet developed during the past four years. At the same time a course of whooping-cough vaccine is given, but the beneficial results from the latter are still much in doubt. Measles serum is used for prevention and attenuation of the susceptible, following the first case of measles reported at a nursery. Table 2 gives the incidence of communicable diseases.

NURSERY CLASSES AND NURSERY SCHOOLS

Although comparatively few, and limited mostly to the larger towns, nursery classes and nursery schools have proved of value in supervising the health of the pre-school child. These schools are intended for children between the ages of two and five years and should be of the open-air type. This additional facility to the educational system will undoubtedly be extended. The advantage from the medical aspect is that the children are examined and many of their physical defects remedied before they enter the normal curriculum of their educational life. To demonstrate the importance of their early examination, it is found that about 15 per cent of the children have medical defects, the most common being defects of the eye, nose, throat and skin.

CONCLUSION

This is necessarily a brief review of existing nursery facilities which have to a great extent been improvised. With regard to the future, it is considered by many competent authorities that day nurseries will have to be provided, even if in some modified form, to satisfy the demand of mothers of the nation.

NOTES AND QUERIES

CORONARY THROMBOSIS AND OBESITY

QUESTION—A practitioner in Wales writes.—

"I wonder if you could help me with a detailed obesity diet for a young man aged thirty-five, suffering from a confirmed coronary thrombosis, who has to lose approximately two stone in weight. Should his limitation of diet be gradual?"

REPLY—If the patient keeps strictly to the following diet, he should lose two stone in about 10 months:—

BREAKFAST

Tea, milk.

1 egg or a piece of fish or 1 thin rasher of bacon

1 thin slice of bread (1 oz.)

Butter—piece size of half a walnut, or margarine.

Tomatoes (1 lb. fresh) or any kind of fresh fruit or any kind of salad.

DINNER

Lean meat or cheese or fish, a good portion.

A good plateful of vegetables or salad.

Any kind of fresh fruit.

1 potato (4 oz.)

TEA

Tea, milk.

1 slice of bread (1 oz.)

Butter—piece size of half a walnut, or margarine.

Any kind of salad or fruit.

SUPPER

Clear soup or broth.

Fish, a fair portion or lean meat or cheese or chicken, rabbit or game.

Butter—piece size of a walnut, or margarine.

A good plateful of vegetables or salad

Any kind of fresh fruit.

1 slice of bread (1 oz.)

Milk, 1 pint.

Sugar, cakes, pastries, puddings, jam, moutza or fried food *must not be eaten*

No beer, or spirits or wine or soft drinks

Plenty of vegetables, salad, and all fresh fruit may be eaten, also tinned fish, e.g. pilchards, and dried fruits

Take one teaspoonful of marmite occasionally, in water in which vegetables have been cooked

Clear soup or broth may be taken at any time

The patient may drink as much water as he likes

The loss of weight on the above diet is usually gradual, although a sudden drop may occur within the first week. If any gastric discomfort occurs the vegetable and fruit should be sieved, in which case ascorbic acid should be added

ROSE SIMMONDS, S.R.N.

RENDERING BOILED MILK PALATABLE

QUESTION—One of the practical difficulties about boiling milk is that so many children object to the "skin" that practically always settles on the surface of the cooling milk. To remove this "skin" means depriving the milk of a considerable amount of its food value. Is there any simple method of preventing the formation of such "skin"?

REPLY—"Skin" formation is due mainly to

the coagulation of lactalbumin around the rising fat globules of the milk. Its formation is difficult to prevent entirely, but it is minimized by heating the milk in a jacketed saucepan fitted with a lid and by keeping the milk stirred thoroughly so as to maintain more or less uniform distribution of fat throughout. After heating, the milk should be cooled as rapidly as possible, if it has been brought to boiling point, the fat globules will show no tendency to rise.

Professor G. S. WILSON, M.D.,
F.R.C.P., D.P.H.

PHENOBARBITONE IN JAUNDICE

QUESTION—A practitioner writes—"Phenobarbitone has proved to be such an efficient sedative that I have found myself using it often in patients with jaundice in an attempt to give some relief to the intense pruritus. In view of the detoxication of the barbiturates that takes place in the liver, is there any contraindication to the use of phenobarbitone in such patients with jaundice or other forms of liver disease?"

REPLY—Various barbiturates are detoxicated in the liver to different degrees. Those barbiturates which are largely broken down by the liver exert a greater effect than normal when liver function is much impaired. Phenobarbitone is but little broken down by the liver. It is removed by excretion through the kidney. Hence its toxicity is not greatly increased when liver function is impaired. The dose of phenobarbitone employed is small, there is thus little ground for anticipating ill-effects, even when liver function is much impaired. In cases of long duration it may be well not to rely on the use of phenobarbitone alone to the exclusion of other measures which are often effective in mild cases. The effect of local applications may often be greatly enhanced by relatively small doses of phenobarbitone internally.

P. HAMILL, D.Sc., M.D., F.R.C.P.

THE TOXICITY OF PARADICHLOROBENZENE

QUESTION (from a subscriber)—Are the fumes of paradichlorobenzene, which is widely used to protect woollen articles against moth, toxic to human beings and, if so, to what extent?

REPLY—There is no conclusive reported case of paradichlorobenzene being proved toxic to any men who have been working with it. It is a crystalline solid and therefore not volatile. Experiments on its toxicity have been carried out and, although no cases have occurred, it is almost certainly toxic to human beings. Expected acute effects would be narcosis, with liver and kidney damage.

PRACTICAL NOTES

AN INTRADERMAL TEST
FOR VITAMIN C SATURATION

THERE has for long been a need for some simple reliable test for estimating the degree of saturation of the body with vitamin C. In 1938, Rotter introduced such a test, based upon the intradermal injection of a dye decolourized by vitamin C. Subsequent investigators have been anything but unanimous in their opinions concerning the reliability of the test, but L. B. Slobody (*Journal of Laboratory and Clinical Medicine*, May, 1944, 29, 464), on the basis of a careful re-investigation of the test, has produced evidence that suggests that it is of genuine clinical value in assessing the degree to which an individual is suffering from lack of vitamin C. The rationale of the test is simple—A dye, which is decolourized by the vitamin, is injected intradermally. Slow decolourization suggests a lack of the vitamin in the tissues, whilst rapid decolourization suggests there is an adequate amount in the tissues. The dye used is N/300 dichlorophenol indophenol, which is prepared by dissolving 24 mgm of sodium 2-6 dichlorophenol indophenol with about 35 c cm of boiling distilled water in a 50 c cm volumetric flask, cooling and making up to volume. The solution must be prepared freshly every other day. Using an ordinary tuberculin syringe and a short no. 26 needle, the syringe is rinsed twice with the dye before injection, and the injection is made into the skin of the forearm, about 0.05 c cm being injected so as to raise a wheal approximately 3.5 × 4.5 mm. The exact time of injection is noted, and then the time when the blue colour produced by the dye disappears, ignoring the pin-point dark blue spot which may occur at the site of needle puncture and which may persist for some time. According to Slobody, a skin test time of more than fourteen minutes suggests a definite degree of body unsaturation, from nine to thirteen minutes mild unsaturation, and less than nine minutes a normal amount of vitamin C in the tissues. It is pointed out that lack of correlation between the skin test findings and the level of vitamin C in the blood does not invalidate the test, as the blood level reflects recent intake of the vitamin whilst the skin test reflects the degree of saturation of the tissues, which need not necessarily correspond to the blood level at the actual moment of the test, and which actually is of much more significance in assessing the status of the individual, so far as vitamin C is concerned. A simple, reliable test should be of considerable value in diagnosing minor degrees of vitamin C deficiency and in gauging the response to treatment.

PAREGORIC AS AN EXPECTORANT

LABORATORY investigations carried out by E. M. Boyd and M. L. MacLachlan (*Canadian Medical Association Journal*, April, 1944, 50, 338) provide data confirming the high clinical reputation which paregoric (camphorated tincture of opium, B.P.) has had as an expectorant for at least two centuries. Using a method based upon measurement of the output of respiratory tract fluid, which has been elaborated for the investigation of expectorants, they found that in all the animals investigated, which included cats, rabbits, guinea-pigs, hens, and albino rats, paregoric produced an increased volume of respiratory tract fluid, varying from 26 to 331 per cent. They also found that this effect was annulled by section of the afferent vagal fibres from the stomach, thus suggesting that the expectorant action of paregoric is due to a reflex initiated through the stomach. Whilst each of the individual constituents of paregoric (tincture of opium, camphor, benzoic acid, oil of anise, and alcohol) produced an increased volume of respiratory tract fluid, the summation of the effects of the individual ingredients was not so great as when they were combined, as paregoric. This synergistic action was also obtained with preparations of paregoric that were at least one year old, fresher preparations having a much less marked effect. On standing for long periods paregoric develops a dark brown colour, as compared with the pale, light brown colour of fresher preparations, and it is this dark brown preparation that is most effective. Whether some interaction occurs over a period of time between the individual ingredients that is responsible both for this darkening in colour and the enhanced expectorant action is a problem still awaiting solution. As these experiments have produced such consistent results in a large variety of animals, it is probable that their results can be applied to man, thus justifying the use of this old therapeutic measure in the treatment of dry, hacking coughs, provided preparations of paregoric that have been matured for at least two to three years are used in preference to fresher preparations.

IMMUNIZATION
AGAINST WHOOPING COUGH

ONE of the difficulties in assessing the efficacy of immunizing against whooping-cough is the rate of exposure to infection after immunization. In Iceland, according to N. I. Dunér, S. Thoroddsen and H. Augustsson (*Journal of the American Medical Association*, May 20, 1944, 125, 200), an epidemic of whooping-cough occurs about every seven years involving prac-

tically everyone, with the result that it can probably be safely assumed that almost every child born since the last epidemic has not been exposed to infection and will be exposed during the next epidemic. This fact lends enhanced significance to an investigation made by these authors on the results of vaccination of a large group of children in Reykjavik, which was instituted immediately on the first case of an epidemic being recognized. For technical reasons the dosage given was small—a total of 18,000 million organisms in the course of twelve to twenty days, the vaccine containing 1,000 million organisms per c.cm., four injections were given at intervals of four to seven days, beginning with 0.5 c.cm., followed by three injections of 1.0 c.cm. The results are summarized in the following table, in which "mild" means no paroxysms, "medium" means five to ten attacks in twenty-four hours, and "grave" means more than ten attacks in twenty-four hours or pneumonia.—

Unvaccinated controls	Number	Per cent.
No pertussis	6	4.9
Mild pertussis	60	49.2
Medium pertussis	42	24.4
Grave pertussis	14	11.5
Vaccinated children	Number	Per cent.
No pertussis	218	28.3
Mild pertussis	381	49.5
Medium pertussis	130	16.9
Grave pertussis	41	5.3

Of the unvaccinated children, 31 per cent had fever for a longer or shorter period, compared with 20 per cent. of the vaccinated. Pneumonia occurred in 33 per cent. of the control group and 16 per cent. of the vaccinated group. The average duration of sickness was little affected by vaccination, being 9.8 weeks for the controls and 8.1 weeks for the vaccinated group. As the authors point out, the results would probably have been better if it had not been necessary to administer a weak vaccine in the shortest possible time but, even so, the results do suggest that vaccination is of definite value as a prophylactic measure against whooping-cough.

INTRASTERNAL BLOOD TRANSFUSION

The advantages of blood transfusion by the intrasternal route in patients in whom suitable veins are not available for injection is stressed by T. Naegeli (*Schweizerische Medizinische Wochenschrift*, April 10, 1943, 73, 460. *Abst. Journal of the American Medical Association*, July 22, 1944, 125, 876). The needle should be inserted in the middle of the sternum, at the level of the second or third interspace. If the point has entered the bone marrow a slight pain is felt by the patient on aspiration of blood. The introduction of a small amount of sterile fluid

into the mediastinum by piercing the inner plate is not harmful. Using a 20 c.cm. syringe, Naegeli has given transfusions of human serum or sodium chloride solution in amounts up to 1000 c.cm. in one to one-and-a-half hours, and in five to eight hours by means of a drip. It is stated that in restless patients or those with peritonitis, continuous intrasternal transfusion is preferable to intravenous drip, and the patient is able to adopt the lateral position or to eat with the needle in position. The method of intrasternal transfusion is advocated for cases in which severe dehydration is present, as in many intestinal diseases or severe burns with extensive skin lesions, but is contraindicated when there is any disease of the sternum and in aortic aneurysm.

VITAMIN B AND IRRADIATION SICKNESS

VARIOUS workers have drawn attention to similarities between the features of irradiation sickness and certain dietary deficiencies. Impressed by their previous success with nicotinic acid in the treatment of this distressing condition, W. B. Bean, T. D. Spies, and R. W. Vilter (*American Journal of The Medical Sciences*, July, 1944, 208, 46) investigated the effect of a standard irradiation of the abdomen in sixteen subjects, consisting of five nutritionally normal individuals, one normal male who had been kept on a vitamin B-poor diet for six weeks prior to irradiation, three pellagrins, three subjects with mild pellagra, one female with peripheral neuritis, and three subjects with "subclinical vitamin B deficiency." The results showed that the normal subjects taking a good diet or on vitamin B supplements had no ill-effects, with the exception of nausea in one of them. All the other patients, including the normal individual who had been kept on the vitamin B-poor diet, showed manifestations of irradiation sickness. Once irradiation sickness was established, the injection of larger doses of thiamin or nicotinic acid, or both, had little effect in relieving it, but in three subjects, in whom the effects of irradiation were compared, with and without a preliminary period of treatment with thiamin or nicotinic acid, it was found that such preliminary therapy largely prevented the onset of irradiation sickness. Full details are given of an interesting case of carcinoma and myoma of the uterus in which repeated deep X-ray therapy was given, always producing severe irradiation sickness, this patient was not given supplements of thiamin or nicotinic acid and she subsequently developed what is described as "classical pellagra and beri-beri." The dosage used in the course of this investigation was thiamin, 50 mgm. daily; nicotinic acid, 300 to 500 mgm. daily.

NOTES AND PREPARATIONS

INSULIN—A reduction in the retail prices of the different types of insulin came into force on October 2, 1944. The new schedule of prices is arranged by the British Insulin Manufacturers as.—*Insulin* 20 units per c.cm.—5 c.cm. 1s, 10 c.cm. 1s 10½d, 25 c.cm. 4s 6d, 40 units per c.cm.—5 c.cm. 1s 10½d, 10 c.cm. 3s 6d, 80 units per c.cm.—5 c.cm. 3s 6d, 10 c.cm. 6s 8d. *Protamine Zinc Insulin* 40 units per c.cm.—5 c.cm. 2s 4d, 10 c.cm. (no change), 80 units per c.cm.—5 c.cm. (no change). *Globin Insulin* (with zinc) 40 units per c.cm.—5 c.cm. 2s 4d, 80 units per c.cm. (no change).

SEVENSEAS COD-LIVER OIL—At the request of the Ministry of Health, the manufacturers of this well-known product are issuing round instead of oval capsules. The change operated from the beginning of October, 1944, and has been made to facilitate increased production. This indicates that there will be a gradual increase in the supplies of SevenSeas available.

THE RETREAT, YORK

THE annual Report for the year ending December 31, 1943, contains an interesting section on the use of pre-frontal leucotomy, the year marking the inception of this procedure at the Retreat. Highly gratifying results were obtained in one case, and some measure of improvement was noted in the others. That the need for early treatment in psychotic disorders is becoming more generally recognized, both by patients and their medical advisers, is shown by the number of voluntary patients admitted during the year, the figure being the highest yet recorded. The report is published by William Sessions Ltd., the Ebor Press, York.

REST-BREAKS FOR NURSES AND MIDWIVES

THE issue by the Ministry of Health of a circular (118/44) dealing with *Rest Breaks for Nurses and Midwives*, draws attention to "The Rest-Break House" at Buxton. Originally the Bedford Hotel, the building is modern and comfortable, and rules and regulations are stated to be almost non-existent. Accommodation can be obtained by qualified nurses and midwives for the modest sum of two guineas per week, and by nurses in training and pupil midwives for 25s per week. Further information and application forms can be obtained from the Secretary, Miss E. Marchant, 179 Windsor House, 46 Victoria Street, Westminster, S.W.1.

OFFICIAL NOTICES

The Recording of Sickness Absence in Industry (Medical Research Council, Industrial Research Board Report, No. 85) deals with methods of recording sick absences and the return to work after illness, as well as the classification of causes of certified sickness absence and the nomenclature of diseases for the classification of certified sickness and accidents. The Report is issued by H.M. Stationery Office, price 4d. *Rubber Hot Water Bottles* (circular 126/44) refers to a circular issued by the Ministry of Health in 1943 (circular 2755), the arrangements in which respecting the distribution of rubber hot water bottles to hospitals and allied institutions have been revised. The responsibility for the distribution of supplies has been handed over by the Ministry of Supply (Directorate of Medical Supplies) to the departments respectively concerned with the services in which they are to be used. Hospitals in England and Wales and similar institutions should make applications to the Priority Officer, Ministry of Health, Whitehall, London, S.W.1, but it is stressed that such applications should be kept down to the absolute minimum necessary for efficient service.

DEGREES IN PHARMACY

THE Council of the Pharmaceutical Society of Great Britain have recently approved the conferring of a degree in pharmacy by the University of Leeds. In all, five Universities grant pharmaceutical degrees, i.e., London, Manchester, Glasgow, Wales, and now Leeds.

CONTENTS FOR DECEMBER, 1944

DISORDERS OF THE RESPIRATORY SYSTEM

Influenza Epidemiological Aspects By Professor M. Greenwood, D.Sc., F.R.C.P., F.R.S.

Influenza Diagnosis and Treatment By F. G. Lescher, M.C., M.D., F.R.C.P.

Acute Lobar Pneumonia By A. Isle Punch, M.D., M.R.C.P.

Modern Views on Primary Pleurisy with Effusion By Wing Commander Kenneth Robson, M.D., F.R.C.P.

Affections of the Upper Respiratory Tract in Infants By Catherine Chisholm, C.B.E., M.D.

Child Health VI—The Work of the School Medical Service By H. M. Cohen, M.D., D.P.H.

INFLUENZA: EPIDEMIOLOGICAL ASPECTS

By M GREENWOOD, D Sc, F R C P, F R S

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EPIDEMIOLOGY is the study of disease (or health) as a group phenomenon, the epidemiologist's unit of observation is a group—a nation, a city, a parish, a battalion, the clinician's unit of observation is an individual human being. Of course, group and individual medicine merge one into the other, the epidemiologist's group is built up of individuals, the physician, since Hippocrates's day, interests himself in the household of the patient, but there is a broad distinction and, in spite of glorious exceptions, epidemiology has tended to be the study of men not intimately concerned with the treatment of individuals and primarily interested in those methods of study which the public call statistical or mathematical. A consequence is that epidemiological literature seems dry, even repellent, to most medical practitioners, and a writer on the subject is tempted to excite interest by giving rein to a vague rhetoric. Probably no topic offers such temptations of this kind as that of influenza, because no other disease but plague has made such havoc in Europe, and the murderous pandemics of influenza, those of 1847-8 and 1918-19, have given less warning than the plague, so that the country was unprepared for the event. I am conscious that the practical value to a physician of anything I can say of the epidemiology of influenza is small. Far more of the intimate biology of influenza is known now than a generation ago, but it is still not possible to forecast an epidemic or, when an epidemic has broken out, to say whether it will be trivial or deadly. Nevertheless, the records of hundreds of years and the recent work of recent times have produced some information of value.

In the first place, the epidemiological concept of influenza as a clinical manifestation should be wide. That, statistically speaking, signs and symptoms referred to the respiratory organs are much the most important is generally recognized. But physicians and laymen have often spoken of gastric influenza, and thus, under the connotation of influenza, illnesses the signs and symptoms of which seem to refer to many organs may correctly be included.

THEORIES OF PREDISPOSING FACTORS

The late Sir William Hamer and Dr F G Crookshank deserved the gratitude of the medical profession for directing attention to the need of a wide definition of influenza. Like most pioneers, they exaggerated the importance of their conclusions and, as both were disrespectful and not particularly well-informed critics of laboratory methods, their influence on professional opinion has been small.

The notion of a harmony of, or coordination between, illnesses prevalent at particular times is as old as human thought, and the scientific Greek and Hellenistic physicians attributed this coordination to qualities of the atmosphere, which they either believed they understood or might understand. Sydenham accepted the harmony but flatly declined to believe that the atmospheric qualities which impressed it could be studied. In his view, the clinical features of all acute diseases prevalent at a particular time should be studied because, he thought, there was always a common element (the stationary fever) which impressed on biologically distinct diseases a likeness which should influence medical treatment.

Hamer adopted the general proposition and worked out what he called the setting of an epidemic influenza, viz. the epidemiological events which precede and followed it. He was led to conclude not only that some deadly epidemic the "sweats" of the 16th century, were influenzas without predominantly respiratory symptoms, but that agues and prevalences of "nervous" diseases preceded and followed influenzas. The body of evidence in favour of this correlation is substantial. In modern records, notifications of encephalitis lethargica, and even of cerebrospinal fever or poliomyelitis, do seem to increase when influenza threatens. Most physicians would hold that this is no more than an effect of difficulties of differential diagnosis in a sickly season or of a common seasonal factor. But perhaps Hamer and Crookshank were right in believing the connexion to be more intimate. It is certain that the biological causes of influenza, cerebrospinal fever and poliomyelitis, are wholly distinct, so, if there is a connexion, it must be explained in terms of an alteration of herd immunity, the laws of which are so far unknown. My own opinion is that no more can be said than that there is reason to regard an increasing prevalence of unusual recorded syndromes—in a statistical sense—as ominous. How vague this is will be obvious and the reader may well ask whether statistical methods cannot produce something more exact. Several statistical epidemiologists have tried with little success (Greenwood, 1930).

Here it is natural to ask if there is reason to associate calamitous epidemics of influenza with general misery. It is known that in the past, and indeed to a great extent in the present, epidemics of typhus have been as closely associated with "total war" (not a modern discovery) as shadow with substance, and also that the most devastating pandemic of influenza in recorded history signalized the end of a world war. But the association of typhus and misery has been observed in a virtually unbroken sequence of centuries' experience and, biologically, the reason of the sequence is clear. There is no such evidence against influenza. With the help of special pleading a case can always be made, there was, for instance, much amiss in London before the great influenza epidemic of 1847-8—food shortage, typhus epidemic—and usually something amiss can be found if the searcher proceeds *ex post facto*. I am not indeed impressed by the argument that the great influenza outbreak of 1918-19 (a) ravaged countries not at war and (b) did not chronologically affect the warring nations first. It is not unreasonable to think that the conditions of life could have favoured the survival of peculiarly pathogenic and invasive strains of virus, the dissemination of which became ubiquitous. But there is not, and could not be, any evidence of this, and the medical profession is left guessing.

STATISTICAL FACTS

I pass to epidemiological facts. It is statistically certain that a majority of great European epidemics have culminated at the end of the winter and that those which have raged between April and September have not been killing diseases. The most deadly epidemics, those of 1847-8 and 1918-19, began in late autumn and passed their maxima before the normal date. The force of the epidemic is usually spent in seven to ten weeks and the rise is much steeper than the decline. In London in 1918, the deaths ascribed to influenza in the forty-first week of the year were 80, then 371, 1,256, 2,458, 2,433, 1,665, 1,178, 942, 660, 322, 186, 95. Usually the interval between successive epidemics is more than six months, indeed longer, but there have been exceptions of which the most dramatic was the experience of 1918-19, when within hardly six months three great epidemics occurred.

SUSCEPTIBILITY AND ACQUIRED IMMUNITY

The most plausible explanation of the interval between epidemics of, for instance, measles, is the exhaustion of susceptibles. If the *materies morbi* is widespread, all susceptibles take the disease and are eliminated or acquire immunity which is only slowly lost, at the same time susceptibles are born in or immigrate into the community, and again conditions are ripe for an explosion. All epidemiologists have not accepted this view. One objection to it, that epidemics of measles die away before anything like the whole of the children have taken measles, and that it is not true that within infected households all the susceptible children are attacked, can be met by supposing that subclinical infections confer a measure of immunity. There is indeed evidence that children who have passed through one exposure without apparent reaction are relatively resistant in later epidemics but it would be going much too far to say that changes in host reaction are a complete explanation, either of the intervals between epidemics or of rise and fall of an epidemic wave itself.

There is ample proof (Greenwood *et al*, 1936) of variation in the ability to cause epidemic phenomena of strains of organisms recovered from mice in herd, but, in an experience of many years, this has been an exception rather than a rule, a dramatic example of a murderous epidemic not associated with any antigenic change in the virus was impressive.

A herd of mice was maintained, into which the virus disease *ectromelia* had been introduced, in a state of equilibrium, viz. deaths balanced or fell a little short of accessions, for more than thirteen months. As mice in herd have an average lifetime of only a few weeks, this would correspond to many years of epidemiological stability in a human society. The herd was exposed to a few days of intense summer heat and some mice died, apparently of heat stroke. Soon an epidemic of the specific disease began and the population was reduced from over 250 to under 70. Strains of virus recovered during the epidemic phase showed no antigenic differentiation from the strain originally used.

The general impression given was that a herd of mice is always in a state of unstable epidemiological equilibrium which may be disturbed in many ways, the experiment led no nearer to the truth, in spite of the advantage of knowing the precise pathology of the disease studied.

Since the discoveries published in 1933 by Wilson Smith, Andrewes and Laidlaw, much has been added to the knowledge of the biology of influenza,

a good critical summary of this knowledge will be found in Burnet and Clark's (1942) memoir. In reviewing this memoir, Wilson Smith (1943) wrote —

"After a decade of intensive research it is now realized that the problem is infinitely more complex than was suspected and we still seem to be as far as ever from the goal of successful prophylaxis. In some epidemics no virus, and in others antigenically different viruses have been isolated. From half a dozen clinically indistinguishable cases perhaps only one will yield virus. Antibody production occurs often without overt infection, whilst infection may occur in spite of a high antibody level."

Had the epoch-making discoveries been made twenty years earlier so that the pathologists and epidemiologists of 1918 would have had command of a new technique, the general problem of influenza might now be solved. *Dis aliter visum*, we can only reason on what we know. In one respect data of 1918 seem decisively to confirm a remark of Wilson Smith just quoted. In four great English Public Schools an exact record was made of the attack rates in the autumn influenza on boys who had been or had not been attacked in the summer wave. The results were —

School	No. of Boys	Autumn Attack Rates (per cent)	
		Attacked in summer	Not attacked in summer
Clifton	451	13.6	34.3
Haileybury	515	22.3	21.3
Eton	753	7.4	47.8
Harrow	429	32.0	76.1

The results in Haileybury contrast so strikingly with those in Clifton, Eton and Harrow that it is plainly a question of disparate epidemiological events.

EPIDEMIOLOGICAL VARIATIONS

In reasoning about 1918-19, it is necessary to distinguish between epidemiological events without precedent, with some precedents and with many precedents. In the first category can be put *compression* — three high waves within little more than six months. There have been instances of a sequence of two epidemics within six to eight months but none, so far as I know, of three. Next in rarity was the dramatic shift of age incidence. It is true that in past experience a severe epidemic has been associated with a quite significant shift of incidence towards younger ages, but never so sudden a change as marked the beginnings of the three 1918-19 waves. The two other features, an influenza with high mortality preceded by a mild but widespread infection and a pandemic incidence, have numerous precedents.

SOCIAL CONTRIBUTORY FACTORS

Before attempting to find an explanation, it is necessary to inquire whether or not during the last two generations, from the pandemic of 1889-91, influenza has been a greater scourge than in earlier times. Making all allowances for changes of nomenclature, and ignoring 1918-19, it is, I think, certain that what is commonly called influenza has become more menacing. If that is so, the question arises "might contemporary changes in habits of social life be relevant?" It has, for instance, been suggested that centrifugal housing and centripetal working, favourable to a decline of tuberculosis, favour the emergence of influenzas. This is the argument — The natural resistance of an urban population to tuberculosis is high.

to break it down constant exposure is needed, hence the importance of better domestic housing and more hygienic work places. Resistance to influenza is low and if populations are exposed, even for relatively short periods, to intense overcrowding, as they are in the rush hours of public transport, the chance that sooner or later an infective strain of virus will be disseminated is increased. It is a plausible argument, but has never been tested, it would indeed be difficult to plan a field test, because the change of social habit is universal. This at least is true—If invasive and epidemic strains of virus are rare mutants, if they are ripened by passage through particular human soils, also rare, if, when the particular seed and particular soil meet the result follows, modern suburbanization does provide most favourable conditions for epidemiological drama.

SEASONAL INFLUENCE

Burnet and Clark (1942) thought the balance of evidence inclined to favour the opinion that the 1918 virus differed from earlier strains in power of invading tissues not normally involved in the clinical evolution of influenza. Perhaps a dialectician might say this does not amount to much more than to say that the influenza of 1918 (autumn) was much more deadly than any previous influenza. If all the weight of explanation is to be put upon changes in the virus, the fact of succession must be accounted for—(1) The relatively mild but widespread summer* influenza in which the deaths already showed the changed age distribution, (2) the much more deadly autumn wave. At first the virus acquired infective power, then it acquired killing power. I do not think enough is known to justify saying more.

CONCLUSION

The foregoing has shown that the pessimism of the opening paragraphs was justified and that epidemiologists can so far give practitioners small help in the fight against influenza, cannot indeed tell them when to expect an outbreak of influenza. Since 1940, the civilian populations of great cities distributed over thousands of miles have been subjected to conditions of overcrowding which surpass anything that can be attributed to the social changes referred to earlier, but no great epidemic of influenza has been generated, so far, fears have been liars. There is no need, however, to despair. It is only eleven years since what was, in the strict sense of the phrase, a new epoch in research began. Eleven years make a tiny fraction of epidemiological history, fundamental research must be slow and influenza is a very old enemy.

* It is usually said that the summer *attack* rate was higher than that of the autumn, but there are no complete data. The sampling inquiry made in Manchester gave a higher summer attack rate but in Leicester the autumn rate was much the higher.

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It is true that vomiting and diarrhœa may sometimes occur as early symptoms in influenza, just as they can at the onset of other acute infections, but to consider these as the protean symptoms of influenza is not without danger

THE COMPLICATIONS OF INFLUENZA

INFECTION OF THE LOWER RESPIRATORY TRACT—The most common cause of a continuation or recurrence of pyrexia in influenza after the sixth day is the extension of the infection downwards to the lower respiratory tract, to the bronchi and bronchioles, and to the lungs themselves. The infection may be caused by the virus itself but more often is due to superadded infection by secondary pathogenic organisms, the most common being *H. influenzae*, others are *M. catarrhalis*, the pneumococcus, Friedlander's bacillus, *Streptococcus viridans* or *hemolyticus*, and, more rarely, the *Staphylococcus aureus*.

The clinical picture and the physical signs of acute bronchitis, bronchiolitis or alveolitis are not, however, always so clear-cut as described in the textbooks, and these conditions tend to merge one into the other, and may be complicated still further by the diversity of the secondary bacterial invasion.

Acute bronchitis tends to start insidiously. There is an increase in cough and expectoration, the sputum becomes muco-purulent and occasionally streaked with blood. If the breathing becomes wheezy it is due to spasm of the bronchi. There may be some impairment of note over the bases of both lungs, with some diminution in the volume of the breath sounds. Generally, numerous coarse and medium râles are heard, scattered throughout the lungs, usually more numerous over the lower lobes. There is little or no increase in the respiratory or pulse rates and, the disease is confined to the bronchi, there is seldom cyanosis. The rise of temperature rarely exceeds 101° F. and, in the absence of further complication, it persists for a few days only.

Acute bronchiolitis or capillary bronchitis is due to an extension of the infection downwards to the bronchioles, generally with some involvement of the alveoli as well. The condition may be unilateral or bilateral and is generally basal. The essential pathological features are desquamation and even necrosis of the epithelial lining cells of the bronchioles, with obstruction of the lumen by œdema and thick tenacious fibrinous exudate. Other parts of the bronchial tree may show similar changes. Often marked alveolar œdema and emphysema accompany the bronchiolitis, with a hyaline fibrin lining the distended air spaces. This condition may arise acutely at the beginning of an influenzal attack, but usually the progress of the infection downwards is more gradual and the clinical picture appears about the fourth day of the illness. This complication may be relatively slight, on the other hand it may be so extensive that its symptoms and signs dominate the whole clinical picture. In a severe case there is restlessness, obstructive dyspnoea, toxæmia, prostration, and even collapse. Cough is often pronounced and stridor is present if there is laryngeal or bronchial spasm. The sputum may be scanty and tenacious, or profuse and muco-purulent. If œdema of the lung develops, the sputum may be pink and frothy. On examination there is generally some diminution of movement of the chest wall, together with some impairment of note, generally over both lower lobes and extending to the axillæ, unless emphysema

be present. The breath sounds may be weak or even suppressed over scattered areas, due to alveolar collapse. Both fine and medium râles may be heard, scattered all over the lungs, also sibili, suggesting the presence of bronchial spasm. An X-ray film generally shows an increase in the basal shadows, with a fluffy extension, which clears up during convalescence.

A type of severe bronchiolitis with a high mortality, especially in children, occurs sometimes in epidemics, also sporadically, and is described in detail by Hubble and Osborn (1942). Toxicity, cyanosis and obstructive dyspnoea are the marked features in a severe case.

Pneumonia—The progress of the disease down the respiratory tract may extend and involve the whole tract or may be halted at any level. Consequently, the alveoli themselves may be involved. The influenza virus may be the sole infecting agent, causing possibly one of the forms of the so-called "atypical" pneumonia. The latter usually follows a benign though sometimes protracted course, unless complicated by secondary pathogenic infection. The most common infecting organism is the pneumococcus (Scadding, 1937), though there are others, especially the streptococcus and even the *Staphylococcus aureus*, which may play the leading part. Pneumonia due to these secondary infections occurs in all gradations, ranging from a relatively mild broncho-pneumonia with limited pulmonary involvement to that of a rapidly progressive disease with the possibility of a fatal termination. The severity depends on the nature of the infecting organism, and on the degree of resistance of the patient.

Pneumonia is often associated with a bronchiolitis. The onset may be insidious, the symptoms being continuous with those of the influenzal attack, or the lung complication may start abruptly some days after the apparent decline of the primary infection.

Pneumonia complicating influenza may start with a rigor; the patient looking ill, with an apathetic appearance and a feeling of great weariness. Breathlessness, retrosternal pain, cyanosis, and exhaustion are often marked. The sputum may be scanty, profuse, or muco-purulent and blood-stained, and sometimes it is expectorated in discreet pellets. The physical signs are often few, if the areas of consolidation are small, scattered, or deep-seated. There may be impairment of note with weak breath sounds, generally over one or both lower lobes, together with râles and rhonchi, which may be heard only on deep inspiration. As the consolidation spreads, the dullness becomes more marked, accompanied possibly by weak tubular breathing. X-ray films of the chest show a coarse, diffuse mottling of the affected lungs. With increasing consolidation the shadow becomes more dense, and may even simulate fluid. Resolution can be slow and the physical signs may persist for some time.

The most serious form of pneumonia is due to infection with the *Staphylococcus aureus* or the *Streptococcus hemolyticus*. It was this infection which caused such a high mortality in the last influenza pandemic 1918-19. Sporadic cases have been seen since then. The clinical picture is one of overwhelming toxæmia. The cyanosis, which is such a prominent feature, varies from the colour of cherry red to indigo blue. The sputum is thin and purulent and may be salmon pink in colour. The physical signs, which are generally bilateral, are often sparse considering the

extensive involvement of the lungs. A blood count may show a leucopenia instead of the customary leucocytosis. Pleural effusion and pericarditis are not uncommon, and pulmonary abscess or gangrene may follow, especially in staphylococcal infections.

Pleural effusion can occur with great rapidity in this type of pneumonia, and a massive exudate may even develop overnight. Consequently, the true nature of this condition may be overlooked, and even mistaken for consolidation of the lungs, as bronchial breathing is sometimes heard over the fluid. The latter may be serous, sero-hæmorrhagic or purulent. The formation of an intralobar type of empyema is not infrequent.

FURTHER COMPLICATIONS OF INFLUENZA

Other infections—As influenza predisposes to secondary infections with a variety of pathogenic organisms, it is not surprising that other parts of the body can become similarly infected. Among the more frequent conditions are subcutaneous abscesses, conjunctivitis, sinusitis, otitis media, arthritis, and even osteomyelitis. Nephritis can occur, although in the last pandemic it was rare.

After influenza, patients are rather more susceptible to other types of infection, presumably due to a lowered resistance. Thus, tuberculosis may first appear after an attack of influenza, and this is too common an occurrence to be explained by mere coincidence.

Cardiovascular system—A heart already the seat of organic disease may be damaged still further by an influenzal infection. The latter, however, generally exerts its effect more on the peripheral vascular system than on the heart itself, for it is a common experience that after an attack of influenza quite a number of people, especially those exposed to physical or emotional stress and who have not undergone a proper convalescence, are crippled in health for varying periods of time. Undue fatigue, both mental and physical, and emotional unrest, breathlessness, dizziness, tachycardia, palpitations, with irregular action of the heart, and precordial distress are symptoms which are commonly met with. This condition is known by several terms, though all inaccurate, such as "effort syndrome," "disordered action of the heart," or "neuro-muscular asthenia", but there is general agreement that the heart itself is not the real seat of the trouble. These symptoms, should they arise, must be carefully explained to the patient, and no loose and inaccurate diagnosis, such as a "weak, strained, or tired heart" should be allowed, nor a long period of confinement to bed ordered, with a warning of the avoidance of exertion afterwards. Quite easily seeds of an anxiety state may be sown.

Other vascular complications may arise in rare instances: thrombophlebitis, purpura and diffuse erythema. Sometimes a post-influenzal bradycardia may develop.

Central nervous system—Mental depression, an anxiety state, and many subjective nervous symptoms are established sequelæ of influenza, especially if the illness has been prolonged on account of various complications. Neurasthenia, a state of nervous exhaustion characterized by increased fatigability, lack of power of concentration, inability to deal with the ordinary problems of life and to make

decisions, together with insomnia and a lowered blood pressure, may start after an attack of influenza and prolong greatly the period of convalescence. Certain organic nervous diseases, such as meningo-encephalitis, myelitis and multiple neuritis, are attributed sometimes to influenza. Proof, however, is lacking that these nervous disorders are due actually to the viruses of influenza, or even that they are complications, since a febrile illness followed by an infective nervous disease may well be due to an invasion by the organism which is responsible for the nervous disease itself. But, judging from the analogy of the affinity of many types of virus infection for nervous tissue itself, for example the viruses of mumps, measles, vaccinia and possibly epidemic hepatitis, it is not unreasonable perhaps to suppose that the nervous system can be directly affected by the viruses of influenza. More research, especially on serological and statistical grounds, is necessary.

THE TREATMENT OF UNCOMPLICATED INFLUENZA

Despite the success of the discovery of the causative agent in some at least of the epidemics of influenza, there is as yet little convincing evidence of the efficiency of specific treatment in either the prevention or cure of virus influenza. But there have been recent reports from the U S A claiming some success in the prophylactic use of influenza virus vaccine, although the immunity conferred may be incomplete and may last but a short time.

Recently the United States Army Medical Department have carried out a clinical trial of the prophylactic efficiency of a concentrated inactivated vaccine containing the viruses of influenza "A" and "B", given shortly before or at the beginning of an epidemic. It has been found that the incidence of clinical influenza among 6,263 men who had received this vaccine was 2 per cent, whereas among the controls the occurrence was 7 per cent. The difference of incidence between the vaccinated and the controls was found to be greatest at the height of the epidemic. The duration of the effect has not as yet been determined. The results of serological and virus investigations are being studied but have not yet been published.

The Ministry of Health (1944) has, consequently, proposed a trial of this type of prophylactic vaccine, and in order that an outbreak of influenza can be identified as early as possible, when the virus is perhaps of lower virulence, certain hospitals and medical practitioners have been asked to cooperate, when any sign of an outbreak appears, by sending specimens of blood from suspected patients to the National Institute for Medical Research, London, N W. Five c cm of blood should be taken within forty-eight hours of the onset of the illness, the second ten to fourteen days later. A positive result will depend on detecting a rise in the level of the antiviral bodies in the blood.

General measures—The actual treatment of uncomplicated influenza is, for the present at any rate, symptomatic. Much can be done to lessen the complications by absolute confinement to bed from the onset until convalescence is well established. In an effort to limit the spread of the disease, the patient should, as far as possible, be isolated, especially from sources of secondary infection. For his own protection it is advisable for the attendants to wear gowns and masks. Discharges from the nose and the sputum should be collected and destroyed. Contamination of the hands and utensils may be other means of spread. As a fluid diet is apt to cause flatulence, it is wise to leave the patient on a solid diet. Headache and the generalized pains are helped by aspirin or other analgesics.

Phenobarbitone, $\frac{1}{2}$ a grain three times a day, helps the restlessness, and 2 grains at night are useful for the insomnia which so often accompanies this infection. Tincture of belladonna 7 to 10 minims in an alkaline mixture, is helpful for flatulence. No advantage is to be gained by repeated catharsis. Sprays containing 2 per cent ephedrine in physiological saline, are useful for nasal obstruction. The irritation of the throat can best be helped by warm isotonic saline gargles. Inhalation of steam, to which is added tincture of benzoin, is comforting for the cough which often accompanies the tracheitis, and a spray containing 2 per cent chlorotone and menthol, or syrup cocilliana, may also be of use.

Chemotherapy with the sulphonamide group of drugs has no place in the treatment of influenza, so far as the virus phase of the disease is concerned. But in an epidemic accompanied by serious secondary infection of the lower respiratory tract it may be advisable to use these drugs prophylactically from the start of the virus infection.

TREATMENT OF INFLUENZA COMPLICATED BY SECONDARY INFECTION OF THE LOWER RESPIRATORY TRACT

The decision to use the *sulphonamides* in the treatment of influenza complicated by secondary infection of the lower respiratory tract will depend on the type and virulence of the infecting organisms and on their sensitivity to this group of drug. They should be used early, when considered necessary, and in full doses, and the treatment should be continued until the infection is well under control. Suitable precautions should be taken, namely, the drinking of at least five pints of fluid in each twenty-four hours, keeping the urine alkaline, and estimating the number of white cells in the blood. The drugs of choice in this series are sulphadiazine if obtainable, or sulphamezathine, as these are considered to be the least toxic of the group.

According to present experience, *penicillin* is of no use against a pure virus infection, but in dealing with the more serious secondary infections, especially those caused by the hæmolytic streptococcus, the pneumococcus, which may in certain cases be insensitive to the sulphonamide group of drugs, and the *Staphylococcus aureus*, which was met with so frequently during the pandemic of 1918-19, treatment with penicillin is likely to be of great benefit. Tests for sensitivity to the drug of the invading organisms should be carried out. Penicillin can be given intramuscularly, 20,000 units every three hours, but the better method is by a continuous intramuscular drip of 100,000 to 120,000 units in a pint of saline every twenty-four hours, this treatment should be continued until the infection ceases.

Cyanosis and anoxæmia are important indications for the use of oxygen, and it should not be withheld until these signs are well marked. The oxygen should be given by a Tudor Edwards spectacle frame apparatus. If a greater concentration is needed, one of the models of a B L B mask should be used.

Steam inhalation—To combat the obstructive dyspnoea which may be marked in bronchiolitis, particularly in children, the patient should be surrounded with steam for short intervals, especially when the breathing becomes difficult. A tent can be used, with the nozzle of the steam kettle pointing inside. In bronchiolitis and pneumonia with obstructive dyspnoea, it is of great importance that no sedatives

except brandy or whisky should be given, lest the cough reflex be abolished, with a resultant increase in the dyspnoea through inability to cough up the mucus plugs blocking the lumen of the smaller bronchial tubes

CIRCULATORY FAILURE—It is difficult to believe that the measures generally recommended for circulatory failure, as shown by increasing cyanosis, a rapid pulse rate, and a falling blood pressure, are likely to be really efficacious. The proper treatment is rather in its prevention. Should circulatory failure arise, the condition of the patient is indeed serious. Nikethamide (coramine), 1 c cm, or strophanthun $\frac{1}{32}$ grain intravenously, should certainly be given. Venesection is recommended by some for patients with cyanosis and distended jugular veins.

PLEURAL EFFUSION may develop even in the course of the pneumonia, when the predominant infection is generally streptococcal or staphylococcal, or later, when it is more likely due to the pneumococcus. In the former the effusion may form quickly, even overnight, and may cause marked cyanosis and dyspnoea, but on no account should any operation in which the chest is opened be performed at this stage, for this is to court disaster. The pleural cavity should be drained by *repeated aspiration*, and this should be followed by injections of from 5,000 to 20,000 units of *penicillin* in an endeavour to sterilize the cavity (Butler, Perry and Valentine, 1944). This procedure should be combined with systemic therapy with penicillin if, as is often the case, the patient is severely toxic. The local treatment may have to be repeated until the infection is under control. Care must be taken to try and inject the penicillin into the different loculi, a somewhat difficult undertaking.

A thickened pleura is likely to develop later, with a lung impeded in its expansion by adhesions and a rigid chest wall. Therefore when the infection is under control, and the pus localized in the pleural cavity by adhesions (estimated by the pus becoming thick and sterile), *intercostal drainage with rib resection* will generally be found to be necessary, together with removal of the fibrinous material lining the pleural cavity. This procedure is especially necessary with a pneumococcal infection. As soon as possible after the operation, breathing exercises should be undertaken to encourage the expansion of the lung.

CONVALESCENCE

The convalescence of a case of influenza complicated by an infection of the lower respiratory tract will need careful management, both from the physical and, in some instances, the psychological points of view, and it may be some time before the patient is restored to full health.

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ACUTE LOBAR PNEUMONIA

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THE symptoms of acute lobar pneumonia are so well known that it seems hardly necessary in an article of this description to do more than refer briefly to certain points in the symptomology of pneumonia which have particular clinical significance and may be frequently forgotten

SYMPTOMATOLOGY

Onset—In some 80 per cent of cases the onset is characteristically sudden with a severe chill and a rapid rise of temperature. The typical clinical picture of the pneumonic patient is attained within the first twenty-four hours. The patient is breathing rapidly and complaining of acute pain in the chest, due to an associated pleurisy. The pain may be so acute as to be almost unbearable, and indeed may be of a severity unequalled in any disease. There is a frequent, partly suppressed cough which for two or three days is unproductive. It is not until the lapse of two or three days that the characteristic rusty sputum is expectorated. The average duration of the pyrexial stage of the disease used to be from four to eight days, but since the introduction of the sulphonamides this period has been considerably reduced. In about half the cases the temperature comes down by crisis. Although this rapid onset occurs in about 80 per cent of cases of lobar pneumonia, in some 20 per cent the onset is more gradual, and the manifestation of the pneumonic consolidation is preceded by such prodromal symptoms as slight respiratory infection, lassitude, aching in the limbs and slight fever. It is important to bear in mind this atypical mode of onset of the disease, else the practitioner may suddenly find that what he thought was a case of a simple cold is in fact a severe case of pneumonia.

Fever—There are one or two points in connexion with the temperature in pneumonia that are worth stressing. In an average case the temperature rises rapidly and has reached its maximum of 104° to 105° F within a few hours. In about half the cases it comes down by crisis within from five to ten days but, as already mentioned, in cases treated with sulphonamides the crisis may occur considerably earlier. A fairly high temperature is a good sign and certainly a low degree of pyrexia (100° F or less) is frequently seen in fatal cases. When the pyrexia persists for an unduly long period it usually subsides by lysis.

Cyanosis—At the onset of the disease there is as a rule some cyanosis, which disappears during the middle stages but may recur later. The disappearance during the middle stages is probably due to the fact that the circulation often ceases to pass through the consolidated area, so that all the blood that passes through the lung does so through normal lung, and can thus acquire the full complement of oxygen.

The cyanosis that recurs later is due to the onset of circulatory failure, and is therefore a sign of grave prognostic significance

Pain—This may be of an acute character. It may be referred to the abdomen, and so simulate an acute abdominal inflammatory condition

Cough—The cough may be absent in atypical forms of pneumonia and in aged and alcoholic subjects, as also in apical cases. It is present in all frank cases in adults, and is dry and suppressed to begin with, the characteristic rusty sputum not appearing for about three days

Sputum—When the characteristic rusty sputum occurs on about the third day, it is semi-transparent, viscid and extremely tenacious and difficult to expectorate. It is at this stage, and not before, that the administration of a mixture containing drugs that will liquefy and aid in the expectoration of the sputum becomes necessary

Hæmoptysis—The rusty appearance of the sputum is, of course, due to the presence of a small quantity of blood. A frank hæmoptysis, however, may be an early symptom in a case of acute lobar pneumonia. When it is observed, the possibility of an acute tuberculous pneumonia should always be borne in mind, especially when the consolidation is apical, but a frank hæmoptysis in a case of lobar pneumonia does not necessarily indicate a tuberculous etiology

Nervous symptoms—These are often present. In children they may take the form of convulsions. In adults, headache, irritability and delirium may all be present. The latter may occasionally take the form of maniacal excitement with homicidal tendencies

Blood—There is no anæmia that can be ascribed to the pneumonic process. A polymorphonuclear leucocytosis up to 20,000 or 30,000 per c mm. is common, and is indicative of a good reaction by the defensive mechanism of the body to the invading organism. An absence of leucocytosis in the initial stages or a fall in the leucocytosis during the course of the disease, without any clinical improvement in the patient, should be regarded as a bad sign

The crisis—The temperature usually subsides rapidly and becomes normal within a few hours on the fifth to the tenth day of the illness. As already stated, in cases treated by sulphonamides the crisis may occur considerably earlier. The phenomena which characterize the termination of this disease are perhaps its most remarkable feature. Within a few hours, a patient who may have appeared to be on the point of death awakes from a sound sleep free from all distressing symptoms, —and moreover without any alteration in the physical signs in the affected lung. The cause of this amazing change is not really understood but is generally said to be due to the establishment of an active immunity to the toxin of the *pneumococcus*. This statement, however, does not elucidate much further the underlying processes of this remarkable change

PHYSICAL SIGNS

It is worth while considering the physical signs in a case of pneumonia with some care. Physical signs are notoriously difficult to detect and, apparently, even more difficult to interpret. Yet from them it should be possible to determine the condition

of the lung beneath that portion of the chest under examination, a matter of supreme importance in diagnosis and prognosis

Inspection—Inspection of the chest in all pulmonary diseases is the most important of all the forms of physical examination, and the most often neglected. It is important for two reasons. First, it is by far the easiest of all methods of physical examination and, secondly, it frequently gives a great deal of information. Often a fairly accurate idea as to the nature of some intrathoracic disease can be obtained by merely looking at the patient.

The typical pneumonic patient appears extremely ill with an anxious expression and rapid distressed breathing, associated as a rule with an expiratory grunt. The *alæ nasi* are dilated and there is exaggeration of the action of the accessory muscles of respiration. Herpes is frequently present on the lips. The physical signs generally manifest themselves in from twenty-four to forty-eight hours, but may be delayed or even absent throughout the disease, when the consolidation is situated centrally in the lung. Diminished expansion is seen on the affected side. Rarely, when the lower half of the left lung is consolidated, pulsation of that part of the chest synchronously with the heart may be seen.

Palpation—This will confirm the deficient movement of the affected side. During the stage of engorgement, i.e., during the first twenty-four hours, the tactile vocal fremitus shows no change. Later it becomes increased. Friction fremitus may be felt. The pulse is full and bounding and in an average case between 100 and 110 per minute. Generally speaking, a slow pulse is a favourable indication. An increase in the pulse rate, and especially the appearance of some irregularity, is of grave prognostic significance, as indicating severe myocardial damage and the probable onset of cardiac failure. It has been stated that when the blood pressure expressed in millimetres of mercury, does not fall below the pulse rate, expressed in beats per minute, all is well. Although there is some truth in this statement, absolute reliability must not be placed upon it.

Percussion—The percussion note is impaired up to the first twenty-four hours, after which it becomes quite dull, with an increased feeling of resistance. The dullness persists for some days after the crisis and it may be some weeks before the normal resonant note returns.

Auscultation—The breath sounds at the onset are suppressed and weak. They soon, however, become typically bronchial in character, i.e., expiration and inspiration are equal in length, there is a pause between the two and the breath sounds have a harsh blowing character. The most important auscultatory sign is the *induræ* crepitation. This appears within the first day and is a fine, crackling, high-pitched sound which is heard only in inspiration. This disappears within a day or two, and during the stage of consolidation no adventitious sounds are produced in the lung. A pleural rub is frequently heard over the solid area. With the onset of grey hepatization, rales (*reduæ* crepitations) are again heard. As the lungs resolve, the breath sounds lose the typical bronchial character, become bronchio-vesicular and finally vesicular but may remain faint for some weeks.

The heart—Careful examination of the heart throughout the course of the illness is of the utmost importance, as the ability of the heart to stand up to the strain put upon it is the chief deciding factor in the ultimate recovery of the patient. In the

early stages there is no change in the heart sounds. At the height of the disease the pulmonary second sound is accentuated and may be reduplicated. A diminution of this accentuation must be regarded seriously, as possibly indicating acute dilatation of the right side of the heart. A systolic murmur is frequently heard and usually is functional, but may be due to endocarditis. The onset of cardiac failure may be sudden but is more often gradual. It is shown by an increase in the pulse rate, return of the cyanosis, dyspnoea and coldness of the extremities. If these appear to a slight degree at the time of the crisis they are not necessarily of serious import, but occurring at a later date they are indicative of grave myocardial damage and must be taken seriously.

DIFFERENTIAL DIAGNOSIS

So characteristic are the clinical appearances and the physical signs of lobar pneumonia when the disease is at its height, that errors in diagnosis would appear to be unlikely. Experience, however, shows that they are by no means uncommon. The chief conditions from which lobar pneumonia has to be differentiated are — (1) The common cold, (2) tuberculous pleural effusion, (3) acute tuberculous pneumonia, (4) broncho-pneumonia, (5) pulmonary infarction, (6) pulmonary congestion.

(1) *The common cold* — The gradual onset of 20 per cent of cases of pneumonia with slight respiratory infection, lassitude, aching of the limbs and slight fever, such as might be ascribed to an ordinary cold, has already been mentioned. The importance of remembering this is clear, and a careful examination of the chest in all such cases is essential in order to avoid missing cases of pneumonia with atypical onset.

(2) *Tuberculous pleural effusion* — One of the most common mistakes in medicine is to diagnose pleural effusion as acute lobar pneumonia. At first sight it might appear difficult to confuse the two, and indeed at the height of the diseases, some four or five days after the onset, the differential diagnosis is easy. It is in the first day or two that the error is made, and it is an easy error to make, unless certain important points in connexion with the physical signs presented by the two diseases are borne in mind. In both diseases the onset is sudden, with a chill, a rapid rise of temperature, dyspnoea, pain in the chest and an unproductive cough. In both diseases the physical signs detected in the chest in the first day or two are a dull percussion note, increased voice conduction and *bronchial breathing*. It is unawareness of the fact that bronchial breathing is the rule in early stages of a pleural effusion and failure to appreciate its causation that are responsible for this error in diagnosis. The explanation of the bronchial breathing heard in early pleural effusion is, of course, simple. The first effect of a small collection of fluid in the pleural cavity is to collapse the lung around patent bronchi. The bronchial breathing is conducted through the partially solid collapsed lung, across the fluid, which is a good conductor of sound, to the chest wall. It is not until sufficient fluid has collected to occlude the bronchial tubes that the breath sounds disappear. The only way therefore to differentiate these conditions at the earliest possible moment is by frequent examination of the chest. In the case of pneumonia

bronchial breathing will increase in intensity daily, or even hourly, whilst in the case of a pleural effusion it will diminish and finally disappear

(3) *Acute tuberculous pneumonia* (caseous pneumonia) — This is a rare condition but unless it be constantly borne in mind it will inevitably be missed when it does occur. The onset, symptoms and physical signs of the two types of pneumonia are precisely similar, save for a predilection of the tuberculous variety for the upper lobes of the lungs, and as a rule no suspicion of the etiology of the condition is entertained until the time at which the crisis should occur has arrived. Then the temperature, instead of rapidly subsiding to normal, loses its continuous character with slight remissions and becomes intermittent and swinging. At the same time the patient's general condition, instead of improving, gets worse. Therefore in a case of pneumonia which runs an unusually protracted course, and in which the patient's general condition steadily deteriorates, the sputum should be examined for tubercle bacilli.

(4) *Broncho-pneumonia* — It is only in elderly and debilitated subjects, in whom the onset and symptoms may be atypical, that any difficulty is experienced in differentiating the two types of pneumonia. The chief points of difference between the two are that in broncho-pneumonia the onset is more gradual, the duration of the disease is longer, the temperature is lower and more intermittent and the cyanosis and dyspnoea are more marked. Moreover, the physical signs of bronchitis predominate over those of consolidation, and the disease is bilateral.

(5) *Pulmonary infarct* — The majority of pulmonary infarcts produce few abnormal physical signs in the lungs. A large one may produce the signs of consolidation. In those cases in which there is some obvious cause for infarction, such as mitral stenosis, little difficulty should be experienced in differentiating it from lobar pneumonia. Those cases in which the embolus is of venous origin and the pulmonary infarction occurs before there is any objective evidence of venous thrombosis, may cause greater difficulty. Even then the signs of consolidation with repeated frank hæmoptyses, the slight degree of pyrexia, if any, and the absence of acute toxic symptoms, should exclude acute lobar pneumonia.

(6) *Pulmonary congestion* — Often patients confined to bed for a prolonged time after a protracted illness or some major operation develop congestion at the base of the lungs. The physical signs of congestion are impairment of percussion note, weak breath sounds and râles. The temperature is only slightly raised and the condition is bilateral. The knowledge that congestion is liable to occur in the above circumstances should be sufficient to prevent a diagnosis of pneumonia being made.

COMPLICATIONS

Unresolved pneumonia — A diagnosis of unresolved pneumonia is frequently met with. It is a diagnosis which seldom, if ever, should be made. The majority of cases of lobar pneumonia, if not all, resolve in the *absence of some complication*. In other words, whenever the signs of resolution are unduly delayed, a careful search for one of the complications mentioned below should be made.

Empyema — This is by far the most common complication of lobar pneumonia. It may arise either during the course of the acute inflammatory stage, i.e. suppurative pneumonia, or after the crisis, i.e. post-pneumonic. The detection of an ordinary

empyema is usually an easy matter, and exploratory puncture will clinch the diagnosis in suspected cases. When, however, the pus collects between the lobes of the lungs, either in the lesser fissure or in the lower part of the greater fissure, there may be little alteration in the physical signs, and such interlobar empyemas may be difficult to locate by exploratory puncture. They may generally be detected by radiological examination, especially by the aid of lateral pictures. Undetected collections of fluid are a by no means uncommon cause of so-called unresolved pneumonia.

Clear pleural effusions—When fluid collects in the pleural cavity in pneumonia it is nearly always pus. Rarely, it is clear serous fluid and becomes absorbed without ever becoming purulent.

Bronchial obstruction—It is by no means an uncommon event, although one which apparently is not widely recognized, for one of the larger bronchi leading to the consolidated area of the lung to become obstructed by a plug of secretion. When this happens, the breath sounds over the affected area, which hitherto have been loud and bronchial, suddenly disappear and at the same time the heart is displaced towards the side of the lesion. It is this latter point, the displacement of the mediastinum towards the side of the lesion, which forms the only distinguishing feature between collapse due to bronchial obstruction and a collection of fluid in the pleural cavity. When this complication occurs, if the patient has not coughed out the obstructing plug in two or three weeks, it should be removed through a bronchoscope.

Pulmonary abscess—Acute lobar pneumonia is the second most common cause of pulmonary abscess, the most common being an operation on the upper respiratory tract. It should perhaps be called a sequel rather than a complication, and should be suspected when the patient's general condition deteriorates, the temperature becomes swinging and hectic, and the sputum increases and becomes purulent. An X-ray picture will usually show an area of translucency in the centre of the opaque solid lung, indicating that the lung is breaking down with cavity formation. As the cavity is generally deeply seated in the lung, cavernous physical signs are not obtainable.

Gangrene—Gangrene of the lung, fortunately a rare complication, can readily be detected, as the patient coughs up large amounts of excessively foul-smelling greenish material. It is generally fatal, but I have met with one case in which the patient made a good recovery after coughing up the greater part of his right lung in a gangrenous condition.

Other complications—Other rarer complications are endocarditis, pericarditis, and meningitis. Pericarditis is much more frequently found *post mortem* than during life.

TREATMENT

THE SULPHONAMIDES—The introduction of the sulphonamides into the treatment of pneumonia is a great step forward. Adequate proof has accumulated to justify the conclusion that they both shorten the duration of the disease and lower its mortality rate, *but* they do not always act, nor is their administration the beginning and the end of the treatment of pneumonia. All the other methods of

combating the toxæmia and supporting the strength of the patient must still be employed

Moreover, there are two points in connexion with this form of therapy which want careful watching. The first is the relative frequency of complications, especially empyema. Owing to war-time conditions it has not been possible to correlate a sufficient number of cases to give any definite figures, nor have any statistical records dealing with the matter been found. The fact remains, however, that I have formed an impression that empyema has been a more frequent complication of pneumonia since the introduction of sulphonamide therapy. This is only an impression and subsequent events may prove it to be false, or if true to be *post* rather than *propter hoc*. Another point that should be remembered is the possibility of deleterious after-effects. Whilst it is true that sulphonamides have an inimical effect on the pneumococcus, it is also known that they depress the polymorphonuclear leucocytes which are an important factor in the defensive mechanism of the body against infection. It is not outside the bounds of possibility that a patient's resistance to infections generally may remain impaired for some time after a course of sulphonamides. Sulphonamide therapy appears at the moment to be at its height, it is being used on a wide scale and in a great variety of diseases. The history of medicine presents many examples of excellent therapeutic measures acquiring some degree of disrepute from excessive zeal and indiscriminate application. It would be a pity if the sulphonamides, from inappropriate use, failure to recognize their possible limitations or other causes, were to suffer the same fate.

Dosage—These drugs must be given in pneumonia at the earliest possible moment and in adequate doses. Of the different compounds available, sulphapyridine is very effective but suffers from the disadvantage of producing toxic symptoms. For this reason sulphathiazole, sulphadiazine or sulphadimethylpyrimidine should be used. For cases of average severity the initial dose should be 2 gm. by mouth followed by 1 gm. four-hourly for five days, and then 1 gm. six-hourly for a further two days. This dosage can be varied in either direction according to the severity of the case, but the administration of the drug should be continued until the temperature has been normal for seventy-two hours.

OTHER MEASURES—Apart from the administration of sulphonamides, the treatment of pneumonia may be considered under three headings—(1) General measures, (2) symptomatic treatment, and (3) specific treatment.

(1) *General*—The general measures to be adopted in the nursing of a case of pneumonia will be found outlined in any book on general medicine and should include fresh air, avoidance of all unnecessary movement of the patient, in order to conserve the strength of the heart, and careful attention to the diet.

(2) *Treatment of symptoms*—Pain. As already mentioned, the pain in pneumonia is often most distressing and it is essential to relieve it. When it is of sufficient severity there should be no hesitation in prescribing morphine in adequate doses, $\frac{1}{2}$ of a grain generally being necessary. In cases of less severity, Dover's powder 10 grains and aspirin 10 grains will often suffice.

Separation of the pleural surfaces by the introduction of 300 c.c.m. of air with an artificial pneumothorax apparatus will often give instant relief, and this method might well be employed to relieve the pain more frequently than is at present the custom.

Sleeplessness The general toxæmia may result in restlessness and inability to sleep, even in the absence of pain and cough. The following hypnotic drugs may be given —

Chloral 20 grains and bromide 15 grains
 Chloralamide 20 grains
 Allonal 2 or 3 tablets
 Dial 1 tablet
 Medinal 7½ grains

The cough. Expectorant mixtures are still frequently given as a routine in pneumonia. It should, however, be remembered that seldom in the early, and only occasionally at any, stage are expectorants needed. When in the early stage there is a distressing irritative cough due to extreme viscosity of the sputum, or to associated laryngeal irritation, a warm alkaline drink will often relieve it. A warm alkaline spray is also useful for this purpose, such as —

R Sodium bicarbonate	10 grains
Sodium chloride	5 grains
Glycerin of phenol	30 minims
Cherry laurel water	120 minims
Water	to 1 ounce

To be used as a spray

During the stage of resolution, when there appears to be rather more sputum than usual, a simple expectorant mixture may be needed —

R Ammonium carbonate	5 grains
Tincture of squill	10 minims
Infusion of senega	to 1 ounce

The mixture to be taken thrice daily

Cardiac failure Whether a case of pneumonia terminates in death or recovery, depends, in the absence of complications, upon the ability of the circulation to maintain its efficiency until the bodily resistance has overcome the bacteriaemia and toxæmia. Therefore at the first signs of cardiac failure, prompt and active steps along the usual lines must be taken to deal with the failing circulation.

(3) *Specific treatment (serum therapy)*—In the few years preceding the war treatment of pneumonia by antisera had made great strides and its value had been clearly proved. Recently its use appears to have been somewhat neglected, possibly owing to the difficulty of obtaining the serum, its considerable cost and a complete reliance upon the sulphonamides. As the latter drugs are not always effective, so important a measure as serum therapy should still hold a place in the treatment of this disease. When the administration of antisera is contemplated the type of the organism has to be determined, as it is only in types 1 and 2 that really potent sera are available. Moreover, the serum must be given early (within the first seventy-two hours of the disease) and in adequate dosage. With regard to dosage, taking 1 c cm to contain about 1,000 units, it is customary to give an initial dose of about 10 c cm, and repeat it every six hours until 100 c cm (or 100,000 units) have been given or until the patient shows obvious clinical improvement. Reactions are extremely rare, but it is essential to inquire whether the patient has ever before received injections of horse serum or been known to show allergic tendencies. If he has, an actual test must be made and, if found positive, the patient must be desensitized.

MODERN VIEWS ON PRIMARY PLEURISY WITH EFFUSION

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PLEURITIS was known to the Ancients. Hippocrates distinguished it from peri-pneumonia, but it is natural that some confusion should have arisen in differentiation and it was a long time before the distinction was generally allowed, practically speaking not until Pinel in 1818 described pleuritis as an example of inflammation of a serous membrane. The distinction once made, emphasis began to be laid upon the close relationship which existed between pleurisy and tuberculosis. Laennec (1846), and indeed the whole French school, did much to further the view that pleurisy was often of tuberculous origin. By applying his knowledge of physical signs Laennec was able to demonstrate the presence of disease in the lungs underlying a pleurisy, and he produced proof positive by *post-mortem* examination. Indeed, he brought knowledge of the subject a stage further, because he appreciated that there might be a period of good health between pleurisy and pulmonary tuberculosis. He wrote that "tubercles are for some time latent and produce no apparent alteration in health, the pleurisy is only the first manifestation, often, indeed, the effect of the presence of tubercles."

PLEURAL EFFUSION AND TUBERCULOSIS

After the announcement by Robert Koch in 1882 of his discovery of the tubercle bacillus, the concept of the infective nature of tuberculosis gained acceptance, and the idea of a purely constitutional origin, never precisely defined, was rejected, if somewhat reluctantly. Experimental work with animals followed quickly, particularly guinea-pig inoculation of pleural fluid, with the production of tuberculosis. This was conclusive for certain types of pleurisy and has been amply confirmed. Despite this proven pleural tuberculosis it was noted that a proportion of these patients did well and lived to old age in good health. Such observations led naturally to the institution of follow-up studies, one of the earliest being by Fiedler in 1882, and it became possible to form some idea of the frequency with which pulmonary (or non-pulmonary) tuberculosis followed at an interval after a pleural effusion. Table 1 summarizes the work of different authors who have dealt with more than one hundred cases in a follow-up inquiry. The results of a personal follow-up investigation at the Brompton Hospital have been added—

TABLE I

Authors	Percentage of total which are untraced	Size of actual series	Method of diagnosis	Use of X-ray		Observation times		Follow up	Tuberc. morbid
				During attack	Follow up	Mini-mum	Maxi-mum		
Hedges (1900)	59 per cent	Cases 130	Needling 67 Phya. signs 63	No	No	Years 2	Years 8	Persnl. examn	43 per cent
urd and Foster (1912)	43 2 per cent.	514	Not stated	No	No	2	28	Mainly persnl examn	47 7 per cent.
eel and oien (1928)	15 per cent	812	Not stated	No	No	1	10	Notifica-tion	22 4 per cent
arde (1930)	Not stated	126	Not stated	Partial use		1	12	Partial persnl	40 per cent.
relius (1933)	15 per cent	194	No clear informn	Not avail-able	Yes	7	17	Persnl examn mainly	39 8 per cent. 66 3 per cent.
allner (1937)	15 per cent	580	X-ray 76 per cent Clinical 24 per cent	Yes 76 per cent	Yes	6	20	Persnl examn	39 per cent
rompton Hospital	30 per cent	111	Needling 76 Clinical and X-ray 35	Yes	Yes	5	12	Persnl examn.	23 per cent. (42 per cent)

he figures in the columns speak for themselves. In the series of Borelius (1933) and the Brompton Hospital, the tuberculous morbidity column contains two figures: in each case the higher figure represents the probable total incidence of subsequent tuberculous manifestations. This larger figure represents both outspoken cases and those in which evidence of a tuberculous lesion, generally in the lung, was forthcoming at the follow-up inquiry, the lesion having been subclinical throughout its whole course.

Post-mortem evidence was also accumulating, Kelsch and Vaillard, in 1886, being among the first to show that tubercles were present on the pleura in cases of pleurisy with serous effusion. Post-mortem evidence is scanty because death in the acute phase of an effusion is rare. It is not disputed that a pleural effusion can be the accompaniment of parenchymatous or pleural tubercles, but it may be doubted if these or other tuberculous manifestations are to be found in all cases. With the increasing use of X-rays it is clear that many effusions are of truly primary type, leaving, after absorption of the fluid, clear lung fields free of any shadows such as might indicate pulmonary tuberculosis at any stage. Yet in a proportion of these primary cases, far in excess of the expected tuberculous morbidity in

general community, pulmonary or non-pulmonary tuberculosis sets in at a later date

In many instances of *primary effusion*, observation over an interval lends strong support to the view that they are of tuberculous origin. The weeks or months spent in the process of stabilization, the relapsing, chronic course, with recurrent febrile bouts, the involvement serially of both pleural spaces and sometimes of the peritoneum, are eloquent of tuberculosis.

With certain apparently primary types of effusion, an analysis of the evidence makes it possible to assign the probable cause. Some are transudates, some post-pneumonic, some traumatic, some associated with neoplasm, whilst others are acute rheumatic manifestations. The majority are primary effusions, and it is impossible to foretell, at the time of the effusion, which patients will subsequently develop pulmonary or non-pulmonary tuberculosis and which will not. In consequence, many authorities believe that all primary effusions should be regarded as being of tuberculous origin, unless there is good reason in a given case to assign some other and definite cause, and the burden of proof thereof is on the patient.

OTHER ETIOLOGICAL FACTORS

Before proceeding it will be profitable to consider briefly some of these alternative explanations for the presence of a pleural effusion if the tuberculous etiology is rejected for some of them.

Post-pneumonic effusion—First should be mentioned the occurrence of a serous pleural effusion following an attack of pneumonia. This is a recognized complication of acute pneumonia and is mentioned in most current medical textbooks. Its frequency is not stated, but it is said that there may sometimes be a considerable accumulation of fluid requiring aspiration. It often occurs late in the disease, sometimes after the crisis, and its appearance may be heralded by some rise in temperature. Whatever may be the true facts about its occurrence and frequency, the advent of treatment by the sulphonamide group of drugs has made the position much more complicated. Cases in which fluid appears in acute pneumonia without the use of the sulphonamides, are unusual, and it must be rare for a patient to present with a pleural effusion, in whom it is possible to be satisfied that the effusion is post-pneumonic. It is possible sometimes, when sulphonamides have been used, to be fairly certain that a case is a genuine post-pneumonic effusion. A good deal of discussion has centred around the development of pleural fluid in these circumstances and it has been said that inadequate dosage leads to the formation of fluid and also, even, that these drugs in orthodox doses may lead to a similar result. It is argued that the condition to be dealt with is, in effect, an attenuated empyema. The difficulty in differentiating a primary effusion from a post-pneumonic one is increased because the patient often comes under observation some days after the onset of the illness, and the original diagnosis rests on clinical findings none too well documented. Temperature charts, which might often be most helpful, are lacking. A post-pneumonic effusion, following the use of sulphonamide for pneumonia, may be expected to show certain characteristics. The fluid is generally transient and absorbed satisfactorily without deformity being evident in the final

X-ray It does not usually attain large proportions. In the early stages of the illness, there is generally a leucocytosis in excess of 12,000 cells per cubic millimetre. If the case has been observed from the outset, the temperature chart can be most helpful and is typified in the example shown (fig 1). In this case the initial leuco-

MARCH APRIL CPL D INITIAL LEUCOCYTOSIS 14,000

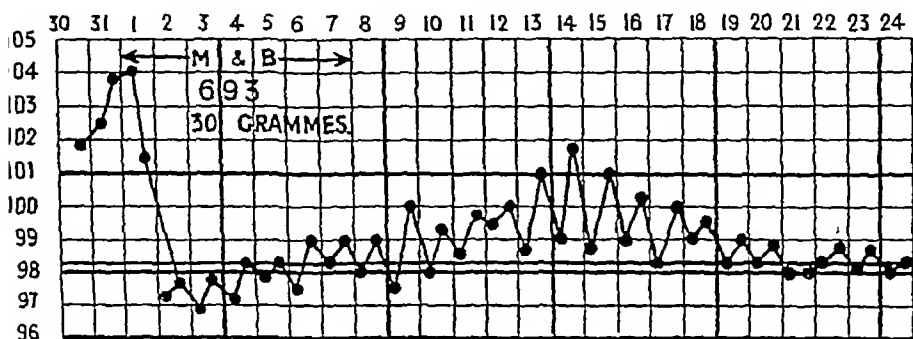


FIG 1

ytosis was 14,000 cells per cubic millimetre. Fluid was suspected clinically and by X-ray about the eighth day after the initial fall of temperature and was proved by sampling. The secondary rise in temperature associated with the formation of the fluid will be noticed.

Traumatic effusion—The second important possibility is that the effusion may be traumatic. This is undoubtedly true in some cases, although it is more usual to find blood, or at least blood-stained fluid, than clear fluid. Sometimes the history of a blow on the chest will be obtained, and there may be evidence of the fracture of a rib. Even so, it can be argued that the blow or other injury has aggravated a latent tuberculous focus and the outpouring of fluid is the result.

Rheumatic infection is cited as the cause of pleural effusion in certain instances. It is doubtful if this should ever be confused with idiopathic pleural effusion, since in rheumatic cases there will always be other stigmata, such as joint pains or a history of their having occurred recently. Usually the pleurisy of acute rheumatism is dry, or at least not associated with the outpouring of much fluid.

PATHOGENESIS OF TUBERCULOUS EFFUSION

If the tuberculous origin of the majority of primary effusions is admitted, then an attempt must be made to assign a place to this phenomenon in the natural history of tuberculosis. To do this various other aspects of pleural effusion must be considered and also some evidence in connexion with primary infection.

Arborelius (1930) investigated a group of strong and healthy men drawn from the twenty-year old conscript class. He had had an opportunity of ob-

a series of cases showing radiological changes in the lung roots, bearing no resemblance to the ordinary adult tuberculosis, but with many points of similarity to that seen in children. Erythema nodosum was sometimes present, and pleural effusion sometimes developed later. He pointed out that, although it was generally considered that adults had usually been infected during childhood, it was possible that the initial tuberculous infection occurred in adults. He applied the Mantoux tuberculin test in 2,230 men of the conscript class, and found the reaction to vary according to the environment in which the men had grown up. Among the natives of Stockholm only 4.8 per cent were tuberculin-negative, whereas for genuine country dwellers the figure was 34.2 per cent. Some of the men who were tuberculin-negative at the beginning of military service became tuberculin-positive during their service. Clinical and X-ray changes were observed in some of the latter, which were thought to indicate the occurrence of a primary tuberculous infection. Nearly one-third of these cases developed serous pleurisy within the next six months. This work, emphasizing as it does the occurrence of primary lung infection in adolescence or young adult life, is of considerable importance, and is relevant to the whole problem of pleurisy with effusion. In a personal communication, Surgeon-Captain Brooks has kindly supplied me with some figures which give a broad view of the incidence of different types of pulmonary tuberculosis in a section of the population. This is summarized in table 2 —

TABLE 2

Individuals between the ages of 15 and 75 examined in the course of a FLUOROGRAPHIC SURVEY	420,176
(1) RADIOGRAPHIC EVIDENCE OF ADULT TYPE PULMONARY TUBERCULOSIS	5,374
(2) RADIOGRAPHIC EVIDENCE OF RECENT PRIMARY TUBERCULOSIS	259
(3) RADIOGRAPHIC EVIDENCE OF RECENT PRIMARY TUBERCULOSIS WITH A SYMPTOMLESS PLEURAL EFFUSION	36

The opportunity arose to observe 63 of the patients in (2) above, six developed a pleural effusion within six months.

No case of recent primary tuberculosis was found above the age of 29 (NUMBER BELOW THIS AGE—370,000 approx.)

From this and other evidence it can be argued that tuberculous infection of the lungs may take place initially in adolescence or early adult life, and that it is accompanied, in a proportion of cases, by a symptomless pleural effusion. Further, there is evidence that a pleural effusion may develop within a few months of a primary lesion being discovered. From the work of Arborelius it appears that environment may exert considerable influence upon the age at which tuberculous infection occurs initially. In his survey, for every one man living in a town showing a negative Mantoux reaction, and therefore presumed to have escaped tuberculous infection altogether, there are six born and brought up in the country in whom the evidence points to a similar lack of sensitization.

If pleural effusions are considered as such, and more particularly the age-groups in which they most commonly occur, in relation to the possibility that the accumulation of fluid may represent a reaction roughly contemporary with a primary lung focus, then the most significant fact emerges that the highest incidence of idiopathic or primary pleural effusion is in early adult life.

Fig 2, taken from the paper of Scheel and Foien (1928), shows the age of incidence of primary pleurisy (serous) in nine hundred and fifty-seven cases —

GRAPH SHOWING AGE INCIDENCE OF PRIMARY PLEURISY (SEROUS)
DURING YEARS 1916—1925

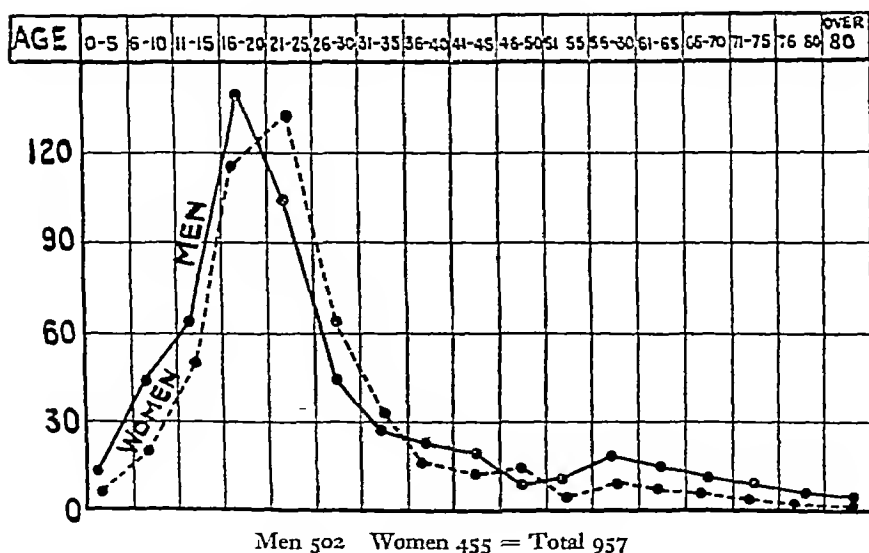


FIG 2

The thesis is put forward that a pleural effusion may occur at one or both of two epochs in the natural history of clinical pulmonary tuberculosis. One of these epochs is at or near the time of primary lung infection, whilst the other may be at any time during the history of the disease. In the latter case the condition is due to what Laennec calls "the effect of the presence of tubercles," and it is believed that the majority of such cases are excluded, by means of radiography or other methods, from consideration as examples of primary pleurisy with effusion. It is submitted that this conception of the effusion, as a manifestation at or about the time of the primary lung infection, takes into account the characteristic features of the condition, the age incidence, the course of the illness and its outcome. If it be assumed that the development of pleurisy and, later, the outpouring of fluid is the effect, whether mechanical, as in some instances, or due to specific sensitivity, as in others, of the presence within the lung parenchyma or root glands of aggregations of minute tuberculous foci, then certain other observations can be fitted into the whole process as thus envisaged. It is possible for the foci themselves to be arrested at an early stage in their development before their recognition is possible by any means available, save in the few cases which come to post-mortem examination. It is to be expected that, in some instances, the accumulation of fluid would be on a small scale, commensurate with one or two isolated aggregations of foci, so that an explanation is forthcoming for those cases in which the finding of a small collection of fluid is a chance discovery, not proclaimed by symptoms of ill-health.

In certain instances such a small collection of fluid never comes to clinical recognition, although obscurity and adhesion of the pleural space is evident, years afterwards, as a fortuitous finding on routine examination

THE MANAGEMENT OF PRIMARY EFFUSION

It is well now to consider the practical implications of this view and how it should affect the management of patients during and after the illness. The fluctuating course, with relapse for no accountable reason, must be stressed, and the extreme instability of the patient during the time that the fluid is appearing, while it lasts and during the time it is disappearing, is also a factor to be reckoned with. Patients with effusion often go on getting worse, even after they have been taken away from their work and rested in bed. It therefore follows that the finding by X-ray, or other methods, of even a small collection of pleural fluid should put the practitioner on his guard. The patient should be taken off work and rested in bed. If this is resented, then at least arrangements should be made for his careful observation. Recourse should be had to all available methods, in an attempt to assess the presence or otherwise of an active inflammatory process. This investigation should include a thorough analysis of the history and symptoms, a clinical examination and comparison of weight with previous weight records, if such are available. Temperature and pulse rate will also be noted and the blood sedimentation rate determined. Obviously, elaborately arranged convalescence will be found unnecessary for some of these cases with minimal effusion.

When a medium-sized, large or total effusion is encountered, the patient should always be put to bed at once. It is best for him to be nursed well propped up and, with large effusions, sudden movements or any effort likely to lead to respiratory stress should be avoided. The fluid should be sampled, about 20 c cm being removed for examination, which should include a special cultural examination and animal inoculation. Patients with primary effusions do best if they receive an adequate period of rest in bed at the beginning of their illness. The rest in bed should be enforced strictly until two full weeks have elapsed after the temperature has settled to normal. In an average case it takes between three and four weeks from the time of onset for the temperature to settle. This gives about five weeks of strict bed rest. The patient is then allowed gradually to get up, to sit in a chair while his bed is made, and to be up and walking to the ablutions three or four times a day. This is all that he is allowed to do in the way of walking. Such a regimen is continued for a further four or five weeks, so that the total time spent either completely resting or mainly resting in bed is about ten weeks. Sometimes it may be longer and sometimes it may be necessary to institute absolute rest, if the temperature cannot be got into control without this.

Then follows a period during which the time up is increased gradually and the walking of prescribed distances is begun, starting with half a mile, increasing gradually until by the end of three months a patient is up all day and walking five miles each day. It is a good plan to arrange a simple walking tolerance test before a patient is allowed to walk an increased distance. Taken along with other findings, this test is a reliable guide to progress. When a patient has reached the stage of being up all day and walking five miles, and if clinical and X-ray findings

point to stability, he will be ready for work. With Service patients some reservation concerning hours of work, type of duty, and perhaps locality, may be required. Supervision should continue for five years, with a clinical examination and X-ray every three months during the first year, and thereafter less frequently.

Convalescence—It is sometimes disputed whether or not a sanatorium is the proper place for convalescence in these cases. Provided the supervision is close, but not over-solicitous, and provided recreation is properly organized, a sanatorium—even with open tuberculous cases in the same institution—can be a most suitable place. Probably, a convalescent institution where the emphasis is on prevention, rather than cure, and specially set apart for cases of pleural effusion is a better plan, and in this connexion it appears that the London County Council have found a nearly ideal solution in recent years. A considerable feeling of improvement accrues when a patient is able to get away from the atmosphere of a general hospital, with its full medical staff and daily ward visits. It is a good plan to explain the nature of his illness to a patient, soon after he begins getting up. He should also be told what is at stake, and the necessity of his achieving true stability. Four to six months of a vegetative sort of existence is a grim prospect at the age of eighteen or twenty, but it is pointed out that it is really a small price to pay for security in the years that lie ahead.

It will be noticed that the handling recommended for these cases is cautious and conservative, the pace slow. The treatment and management are directed first to the acquisition of stability by the patient. On the degree to which this is possible depends the functional result. The least important of all, in these cases, is the anatomical result *per se*. It has been represented that in a primary pleural effusion it is a question of dealing with the unfolding of the tale of primary tuberculous lung infection, this tale is a lengthy one, and during the whole of its unfolding the patient is in an unstable condition. What is sought is a compromise with a chronic inflammatory process or, at least, with an inflammatory process with a tendency to become chronic. The site of the inflammation is delicate lung and pleural tissue. By the very nature of things, any acceleration in activity on the part of the patient, or stress on exertion, may aggravate this particular inflammatory process, which has peculiar properties of being so aggravated. In the acute phase of the condition, the patient may be very near to widespread (miliary) dissemination.

Rehabilitation is the fashionable word applied to a convalescence such as has been outlined. Caution is necessary lest those features of rehabilitation schemes, applied with such good effect and so appropriately after injuries, may be put into force in cases of primary effusion. In this condition, a patient is being dealt with whose control over the inflammatory process is by no means firm, and whose stability is far from secure. Breathing exercises have no place in the treatment of primary pleural effusion, at any rate not until after some months have elapsed. The absorption of fluid and the resolution of adhesions must be allowed to take time. Sunbathing can certainly be harmful in the unstable patient and it is better avoided, even if it were possible to arrange graduated dosage in the vagaries of the English climate. This is not to say that it might not be resorted to with benefit in the case of peritoneal localization, if and when it is certain that the pleural phase is subdued.

ASPIRATION

Nothing has so far been said about the pros and cons of aspiration. In general it is a wise plan to take a sample of the fluid, but apart from this, in the average case the less done the better. This is stated dogmatically, although it is recognized that the presence of fluid in the chest is a serious matter, and any patient with a hemothorax two-thirds or more full of fluid is in danger on this account alone. Rapid accumulation of fluid is dangerous, and a redistribution or reaccommodation of fluid also may well constitute a threat to the patient's life. It is said that the rapid withdrawal of too great quantities of fluid in cases of pleural effusion leads to oedema of the lung, with albuminous expectoration and death. Such a withdrawal appears to initiate a grave disturbance of the pulmonary circulation. Rapid withdrawal of the fluid leads, in effect, to redistribution. Such a redistribution may well occur without any fluid being withdrawn. Displacement of mediastinal structures and thoracic viscera ensues, with acute kinking of the main pulmonary vessels, leading to the reflex production of a state of affairs not unlike surgical shock. It is not possible to foresee this eventuality of redistribution, and it would require the removal of considerable quantities of fluid to ensure a margin of safety from this mechanical risk. Clinically, it presents as a crisis, and the whole aspect of the patient can change in a matter of minutes. Faced with such a crisis, the treatment is to give warmth and restoratives promptly, particularly coramine and oxygen, and the affected side of the chest should be very slowly and gently decompressed by means of a needle connected to an under-water drain, the apparatus being assembled with the fullest aseptic precautions.

Whilst a policy of "holding one's hand" (apart from sampling) may be the soundest one to follow in cases of pleural effusion, there are times when aspiration is indicated. In certain individuals absorption appears to be pathologically slow and the removal of moderate amounts of fluid, even up to a pint, may be of value in promoting absorption. In bronchitis or asthmatic subjects the removal of large amounts of fluid may be required. In total effusions the removal of a pint or even two pints is often of transient benefit only, and, if it is decided that respiratory embarrassment is of a degree to warrant it, *air replacement* might be resorted to. This procedure also has its advocates among those who believe that the presence of tuberculous foci in the underlying lung should be established or otherwise by X-rays. In such cases air replacement is the preliminary to artificial pneumothorax treatment. In cases of prolonged pyrexia, which are very slow to come into control, the removal of a small amount of fluid may be useful.

CONCLUSION

It may be said that the tendency is to regard all cases of primary effusion as being of tuberculous origin, unless proved otherwise. This view certainly holds true of the effusions occurring in adolescence and early adult life (which comprise the majority). There is reason to believe that the effusion is a phenomenon occurring at or about the time of primary infection as it runs its natural, or predestined,

course The primary infective process may occupy many weeks During the whole of this period the patient is in an unstable condition and there is an ever-present risk of aggravation with spread to other serous surfaces The clinical behaviour of some of the cases suggests that they come very near to acute (miliary) dissemination A primary effusion is a sinister reaction in that it carries a 20 per cent risk of pulmonary tuberculosis, usually developing within five years of the effusion

To summarize the position in regard to the presence and removal of fluid, the first principle is that, apart from exploratory puncture, the less done the better, certainly in medium and large-sized effusions Certain special considerations, such as the failure of absorption after a prolonged period or the persistence of fever, may indicate aspiration, even in medium-sized effusions With total effusions the position is more difficult Their immediate danger lies in their potentialities for rapid accumulation or redistribution, with consequent mechanical effect on the pulmonary vessels A state of affairs develops, in part reflex and in part the direct mechanical result, which may prove rapidly fatal There is no guarantee, however, that the removal of fluid at any stage will obviate the development of this state of affairs, and indeed in certain circumstances it might well predispose to it It would seem probable that considerable quantities of fluid would have to be removed to safeguard fully against this eventuality and the removal of such large quantities presents dangers and difficulties of itself

Part of the work on which this article is based was carried out during the tenure of a personal grant from the Medical Research Council at the Brompton Hospital Grateful acknowledgment is made to the Council and to the Medical Committee of the Brompton Hospital

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AFFECTIONS OF THE UPPER RESPIRATORY TRACT IN INFANTS

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THE upper respiratory passages in infancy consist of the nose, with those adjacent sinuses which are already developed, i.e., the ethmoid, the maxillary and possibly the sphenoid, the tonsils, larynx and pharynx. The functions of the upper respiratory passages are to guard the organism by the special sense organ of smell and to prepare the air for the lungs by warming, humidifying and filtering it. In infancy, and especially in the new-born baby, the olfactory sense is not well developed, but even in the premature infant there seems some sense of smell. The filtering, warming and humidifying is mainly performed by the nose.

The physiology of the nose is analogous to that of the adult and must be studied to understand how pathological conditions develop. The anatomy, on the other hand, varies widely from that of the adult and is in itself responsible for many of the upper respiratory troubles of the young infant.

ANATOMY

In the infant, the entrance to the nose is more turned up than in older children and adults, thus there is less protection against the entrance of dust, and such-like. The entrance to the nose is narrow, so that crusts can readily develop and obstruct breathing. But pressure on the tip may flatten and broaden the entrance and allow anterior rhinoscopy more easily than in the adult.

The choanæ in infants are narrow, canal-like and completely separate the nasal canal from the nasopharynx. There may be unilateral or bilateral obstruction of these passages leading to attacks of cyanosis when the child is being nursed, as mouth breathing is not possible in the first two weeks of life, owing to the tongue acting as a one-way valve. Only when the neonatal infant cries does it inhale air through the mouth. If there is nasal obstruction in the infant a rubber tube must be inserted to maintain life (Van Gilse, 1936, Moncrieff, 1936).

The septum of the nose, even from birth, may suffer deviation, but is liable during infancy to develop deflections due to defective development of the dental arch. Deviations of the septum encroach on the inferior turbinate and cause a sense of stuffiness in the nose. They may interfere with drainage. Projection of the septum into the respiratory passages also may lead to desiccation of the secretions and crusts formed on the anterior extremity of the edge of the deviation. Later developmental obstructions to breathing are the saddle-nose found in cretinism and the flat nose of the mongol.

In infants the pharynx and larynx also present definite anatomical peculiarities. The palate forms a more acute angle. The passages are therefore even narrower.

and more easily obstructed than would be expected from the comparative difference in size

Lymphatic tissue is provided in abundance in the pharyngeal lymphatic ring, which includes the pharyngeal tonsils, the palatine tonsils and the laryngeal tonsils, the Eustachian tonsils and the mucosa of the whole of the nasopharynx which is infiltrated with lymphatic tissue. The abundance of this tissue, which develops during the whole of childhood and tends to regress with adolescence, points to its importance in the child's life. It suggests that it is important as the guardian against the ingress of micro-organisms and that it should be treated with the greatest respect. The profuse stream of lymphatics running to adjacent draining glands supports this view. Unless such organs by their size, obstruct respiration, thus causing the adenoid facies and the deaf child, or become the foci of poisons, they should be treated by conservative measures, and the removal of tonsils and adenoids in the young child should be very carefully considered before an operation is undertaken. In infancy this operation is rarely justifiable.

PHYSIOLOGY

The lung tissue is delicate and easily injured. It needs to be protected by having the air warmed, moistened and freed from foreign matter. It cannot easily tolerate extremes of temperature. The tissue and structure of the nose are adapted to perform this function. The ciliary epithelium and the mucus secretion are the means by which this is done. Proetz (1941) points out that the wiping action of the soft palate on the larynx, which completes the cleansing process at the pharyngeal end, depends on the proper moisture of the apposing surfaces of the velum and the pharyngeal wall. The patient suffering from pharyngitis sicca has difficulty in swallowing, with a constant desire to do so (Proetz). These conditions are seen in the constant mouthing and painful efforts at swallowing of a child suffering from severe thrush which has grown on to the pharyngeal wall, as can be seen *post mortem*.

The nasal mucosa lining the turbinate bone and the ostia of the adjacent sinuses, indeed the whole lining of the nose, is provided with (1) cilia, (2) goblet cells, and (3) numerous sets of glandular tissue secreting mucus which provides the so-called mucus blanket of the nose. This gives humidity to the nose and a medium in which the cilia work. These latter are structures of the highest importance, which waft on material into the pharynx so quickly that it is stated the entire nasal blanket is discarded into the pharynx at the rate of at least once in every half-hour (Proetz).

St. Clair Thomson (1936) also states that whilst organisms are arrested and expelled from the nose by means of the cilia and mucus, the nasal mucus in presence of an infection contains an anti-bacterial ferment with a bacteriolytic action. This ferment is known as lysozone and is present in the nasal mucus and in tears.

The natural enemy of the cilia is excessive drying—a few minutes is sufficient to do this. After that a fresh supply of fluid does not restore them, hence danger of improper heating of the air. Cilia can only be kept active in a medium, hence the importance of the mucus. St. Clair Thomson (1936)

little evidence of its presence locally. The symptoms often point only to an enteritis which is essentially parental in origin. Raised temperature or a sudden drop in weight should always lead to an inspection of the ear drum. Any evidence or change in the clear condition of the drum should lead to a paracentesis, but it must be remembered that such a treatment must be carefully undertaken and followed by careful attention to the ear. Even if not much discharge follows the paracentesis there is often a dramatic improvement in the general condition of the child. Evidence should be actually seen in the ear drum that some trouble is occurring in the ear before paracentesis is performed. But many hold that the sudden dramatic drop in weight in a case of enteritis denotes involvement of the ear.

Sinus infection—This is often overlooked and may become the basis of a chronic sinusitis leading to cold after cold. If the nasal catarrh becomes purulent it almost inevitably will involve the sinuses. This may become a serious complication in infancy. It has, according to Brennemann (1944), produced septicaemia at the age of four months in a child infected by its mother. The sinuses may also be affected in allergic conditions, when there is a swollen but pale mucous membrane with the intra-cellular spaces distended with fluid. If infection follows, or is the cause of, the allergic manifestation, the blood vessels become engorged, with consequent further swelling, the cilia are impeded in their work, the secretion becomes acid from the infection, which further impedes the ventilation of the nose because of the injurious effects on the cilia from the acid secretion. Thus in infants the onset of an allergic attack is sneezing, nasal discharge and then nasal stoppage. Repeated colds in infants accompanied by sneezing may arise from an allergic cause. It is difficult to differentiate between an infective and an allergic rhinitis and sinusitis, because the allergic attack so often becomes infected or may even supervene on an infective one. Broadly speaking, an infective discharge is purulent and acid, and an allergic one begins by being clear and alkaline. It is well, when possible, especially in hospital, to have a swab taken and a laboratory examination. A blood examination in an allergic case will show eosinophilia.

TREATMENT—If there is little fever or disturbance, all that is necessary is plenty of fresh air. If the weather is cold, a room with good ventilation, regular temperature and moist air should be provided. The body should be warmly and evenly clad, not overheated. The nose should be kept clear. If there is nasal obstruction a little cotton-wool with fresh salt in the centre, placed just within the nostril, will lead to relief from osmotic action, after which a few drops of a solution of ephedrine, or the proprietary preparation endrine, may be inserted from a dropper. If there is difficulty with feeding, argotone may be dropped into the nose. There will be vasoconstriction and ease in breathing.

In cases of muco-purulent secretion, argyrol can be sparingly used two or three times a day, alternately into each nostril, but silver must be carefully used because of its depressing effect on the cilia. A sulphonamide powder spray is often helpful in clearing up a muco-purulent secretion. If crusts occur, careful cleaning with some oily medium, such as petroleum jelly, is useful.

If the baby is dehydrated, careful use of subcutaneous salines may be useful, but if the lungs are implicated these are not advisable. The diet should be carefully regulated and as generous as the digestion permits. Care must be taken to ensure that all the vitamins, especially B and C, are included.

Gonococcal rhinitis is a condition occurring in the first few days of life, described as being due to an infection from the birth passages. This must be rare. I have not seen a case. A purulent nasal discharge, blood-streaked and profuse, appears suddenly. The child is very ill and cannot suck, and the eyes may be affected. The disease must be differentiated from syphilis, which shows later and should be described rather as a manifestation of chronic rhinitis. In this condition snuffles occur. The nose is stopped up, occasionally there is a blood-stained discharge which a swab will show is not diphtheritic in origin. A Wassermann reaction of the parents and in the later stages an X-ray of the bones will prove the syphilitic origin. A diphtheritic infection must never be overlooked and any blood-stained discharge should be examined for the Klebs-Löffler bacillus.

THE PHARYNX

Retropharyngeal abscesses in the glands of the retropharyngeal space are more frequent in infants than in older children. In this they differ from peritonsillar abscesses, which are more frequent later. They cause obstruction to breathing, which draws attention to them, dyspnoea occurs and there are attacks of threatened suffocation. Examination in the cervical region discovers the swelling on one or both sides. Examination of the pharynx in a good light will show the bulging swelling on one side or other of the posterior wall. There is, as a rule, no rigidity of the neck, as in spinal caries. The examining finger will find fluctuation. Treatment is, of course, surgical.

THE LARYNX

There are various types of *stridor* of an alarming character met with in an infant. Soon after birth a child is noticed to have difficulty with respiration, accompanied by stridor. Sometimes the stridor is not heard for some weeks. The attacks often appear paroxysmal, and over-extension of the child's head may increase the spasm. Occasionally the child is described as pale, cold and the respirations almost ceasing. In these cases an enlarged thymus may be found on X-ray examination, and the latter type of attack may be due to interference with vagal function. The condition generally improves during the first year of life, despite the fact that the thymus normally increases in weight up to the end of the second year. The improvement is probably due to the greater comparative increase in the child's larynx. In bad cases 1/10 and 1/6 of an erythema dose of roentgen rays has been advised (Porter and Carter, 1942). A similar stridor has been found occurring in infants a few months old, one from a papilloma of the larynx and another with abnormality in the formation of the vocal cord. In these cases there is some change in the cry as well as in the development of the stridor.

There is also a type of *congenital laryngeal spasm* without cyanosis and not paroxysmal, and causing no real respiratory distress. In this type the noise is confined to inspiration. Here again the condition tends to improve. By the end of the first year little is heard. Pflundler and Schlossman (1935) say that this stridor is due to an abnormal softness of the larynx. The epiglottis is also soft and apt to roll in with each inspiration. The sounds are with inspiration, slight, and present even in sleep. If breathing is disturbed they get worse. As a rule there is no dyspnoea. The X-ray picture differentiates the condition from the enlarged thymus.

If a laryngeal spasm occurs at the end of the first year, investigation of the calcium in the blood will probably show that spasmodophilia is the cause, even if the typical appearance of tetany be absent

Acute laryngitis may be an extension of infective disease in the nose and throat. It is distinguished by the loud barking type of the cough and hoarseness of the throat. It may be difficult to distinguish from diphtheria. The pharynx should be examined and a swab taken. If there is any doubt, anti-diphtheritic serum must be given, as if the case is diphtheria there is no time for hesitation.

The differential diagnostic points are suddenness of onset and great disturbance in laryngitis, whereas diphtheria is slow and insidious in onset. The cough is greater in laryngitis but the child looks more toxic in diphtheria.

Acute membranous laryngitis from a streptococcal infection is sometimes met with, especially after rhinitis or tonsillitis. The high temperature, as compared with the lower diphtheritic temperature, and the swab are diagnostic points.

Treatment is warmth to the throat externally and warm inhalations internally. A steam tent with Friar's balsam is excellent. Sulphonamides should be given at once in adequate dosage. Throat sprays with mild antiseptics and steam inhalations are called for. It may be that a tracheotomy may be necessary, but these cases are not frequent and I have not seen one needing tracheotomy.

CONCLUSION

I would emphasize again the importance of prevention of respiratory infection. The consequences of upper respiratory infection, both immediate, by extension to other organs, and later on, by disturbance of growth and skeletal deformity, are very serious. Prevention can only be attained by—

- (a) Adequate diet containing a full supply of vitamins. The importance of ascertaining not only the presence of vitamins in the diet but the adequate dosage cannot be over-estimated. Too often lip service is paid to the presence of vitamins. There are available tables of dosage with which all practitioners handling children should be familiar. Adequate first-class protein in the toddler's diet is also often lacking and should be supplied.
- (b) By seeing that the children are accustomed to an open-air life. Apparently the child will stand cold temperatures well if adequately protected from sudden chilling, either by general or partial exposure of the body surface.
- (c) By avoiding, so far as possible, contact with infection, either in the institution or the home.

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ON PROGNOSIS

By S WATSON SMITH, M D, F R C P

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TO estimate the likely term and outcome of any illness is a responsible task beset with difficulty, to measure these scientifically with any accuracy is not possible. A guess or prophecy, always a matter of faith rather than certainty, only tempts fortune. However, a considered verdict, based on clinical findings, will offer a near approximation, until a point is reached when, with irretrievable failure of vital function or structure in a patient, a nearer approach to a correct forecast becomes feasible. In framing an opinion, the practitioner must not forget that he has to deal with a human being who is ill, the extent of whose reaction to the disease has to be gauged, as has the virulence of the disease itself.

Whereas orderly thinking with the right interpretation of warning signs may reveal the truth, loose thinking only invites confusion and error. After summarizing the peculiarities and marshalling all the relevant facts of the case, the question of prognosis has to be approached frankly and presented logically and boldly. An over-cautious evasion which shuns any commitment for fear of being wrong, or displays an exaggerated pity that compels a denial of what is true or likely to be harrowing, should be deprecated. Whether addressing patient or relative, each more credulous in illness, it is imperative not to falsify or deceive, in grave illness, "one must not lie to a dying man." At the same time, if certainty in any case is unattainable, it is right to be guarded in what is said. To try to prognose the course and end of any illness is a duty the medical man has to accept without demur.

METHOD OF APPROACH

The chief factors entering into an assessment are—Age, history, habits, estimation of bodily strength, nature of the disease, results of treatment, attitude of practitioner and consultant, and the psychological effect produced by the interaction of all the circumstances of the illness upon patient and those around. Each factor dovetails into the other together they should draw a broad mental picture upon which to base an opinion to accord with the clinical facts. Although statistics and comparative percentages, if available, may be useful in a study of the subject, in actual practice they are likely, for obvious reasons, to be uselessly fallacious. Figures fluctuate and disagree, sometimes widely, though becoming more favourable these days because of continuing improvement in public health measures, in surgical technique, and in available means of medical treatment. To argue and juggle with numbers at the sick-bed is to equivocate, to perplex, perhaps to be misunderstood.

A valuable possession in any medical man is *clinical instinct*, an intuitive faculty which subconsciously forms an opinion, and confers a quick ability in precise forecasting, being the just result of the sum-total of imprints stored up in the

and rapidly called out by the occasion. Even at the bedside first impressions are often right, they occur in a flash, and can be put down to this identical power of prevision. A medical man so endowed knows what he conceives to be fitting and correct, although it is not always in his power to state the why and wherefore, simply because he cannot call to mind on the spur of the moment all the material facts that informed his opinion. Yet, he is possessed of a mass of collective observation hidden in the subconscious—often a rich fund to draw upon—the reward of much thoughtful reflection, close attention, and a retentive memory, with the wit to profit by experience. In the apt words of Thomas Carlyle—"The value of experience is not in seeing much but in seeing wisely." And wisdom comes from intuition and experience.

The physician "full of phrase and fame" may talk in platitudes, making use of fixed expressions of speech. To be in this way guarded is to be astute in circumventing the irrelevant or doubtful, without signifying lack of attention or knowledge, if it does not spell wisdom, it may imply a commendable tact in dealing with a perplexing, uncertain situation. The practitioner airing without thought his dull and deathly premonition has dropped the substance for the shadow, overthrown all reason and sought to invoke what is only mysterious and false. Some caution is praiseworthy, but it is usually better, as indeed is expected of a practitioner, to offer an opinion as to the future of a patient's illness immediately the examination is over. Seldom should it be necessary to take the matter *ad avizandum*—it is one that will not admit of delay, particularly if nervous tension and apprehensive fears are to be allayed. No statement of the case should be shadowy or conjectural. Is refusal to prognose blameworthy? Being an accepted duty, perhaps it is, although in some circumstances a provisional refusal may be justifiable, e.g., for lack of sufficient evidence to go upon, or when the truth will deprive of all hope—that last bulwark which, denied to patient and those around him, would only paralyse all effort and fortitude. At the same time, if for the moment reserve is better, the whole truth when found ought to be told at once to a responsible, discreet relative, though to none other.

AGE HISTORY HABITS

Age—Infancy and childhood possess a noticeable tenacity of life so that, other things being equal, recovery is the rule. Up to full development, then to the age of forty, lessening thereafter, this proclivity to recover persists as a natural gift, to which is added an acquired immunity conferred by years and previous disease. Each age has its incidence of disease, its own liability to particular diseases fading away as a greater age is arrived at. After fifty, when slowly but surely the conscious limitations imposed by years begin to disturb, degenerative changes, with a lessening vitality and power to resist, alter prognosis, and disabilities begin to gather until about seventy, when the forecast becomes less sanguine, recovery is more doubtful. Improvements, sanitary and medical, have reduced infant and maternal mortality, and have added some twelve to fifteen years to the expectation of life. With this have altered the incidence and nature of disease occurrence, virulence having become lessened in some, aggravated in a few. Further, an

increased expectation means living into an advancing age-group with a changed incidence and another disease tendency

Few, if any, helpful facts may be gathered from a consideration of *history*, whether personal or family. A thought, however, has to be given to the incidence of previous personal illness, and of any familial tendency to diseases, such as rheumatism, tuberculosis or cancer. Active tuberculosis no longer plays sad havoc in families as it used to do, longevity continues to be the happy possession of certain families, and prognosis is now improved and improving with the advent of chemotherapy, the evil effects of certain, common, disease-producing micro-organisms being thereby readily and speedily countered. Here might be mentioned the real need for early initiation of treatment, a factor influencing prognosis greatly. Prompt, successful treatment may mean a speedy, better recovery, its default, delayed or failed recovery.

As to *habits*, alcoholism and syphilis, insufficiently treated, are two killing diseases that blacken the outlook in a number of ways, the more so in the presence of other diseases, causing a profoundly adverse influence on recovery rate and length of days. Addiction to certain drugs is decidedly harmful. For example, the overuse of barbiturates, at present fashionable, is found to disarm the patient by impairing bodily strength and mental power in an insidious way, in some cases almost to vanishing point. All degrees of poisoning by barbiturates are seen, from slight to severe, not rarely adding gravity to a prognosis in serious illness. The vital depression following their misuse is not always recognized or taken into account as it ought to be. Then, again, obesity with its attendant habit of inactivity affects prognosis adversely; the spare, active person tolerates climate and illness much better. In formulizing any prognosis, these various circumstances have their bearing.

ESTIMATION OF BODILY STRENGTH

Who has not seen the case of gravest aspect in the person who walks into the room with approaching death written all over an anxious, ashen-grey face, with livid lips and ears and finger-tips, and, more ominous still, a halting dyspnoea which comes with effort and goes with rest, though without quietening down to a normal, regular respiration? The faint first heart sound at the apex, the low pressure, speeded-up pulse showing alternation by finger or by sphygmograph—these are of gravest import, as also is the tale of paroxysmal attacks of cardiac dyspnoea happening in the night; and they warrant the worst possible prognosis. There is no difficulty here—it is the failing degenerated myocardium when there is no pain, and when the few signs are apt to be overlooked while the patient is resting quietly in bed, that may deceive to blind, when the strength of the myocardium is at its lowest ebb. In these patients, whether ambulatory or bedridden, the death blow is swift and sudden.

The abrupt myocardial infarction, occurring as it does in those rather younger, commonly in men somewhat over fifty, may kill without warning. In a patient with an "abdominal angina," the practitioner may be misled into diagnosing the cause as gastric, with a lamentable result. I have seen a patient with coronary thrombosis operated upon for a duodenal ulcer, found to be non-existent, the patient

unexpectedly during convalescence while in process of taking a meal. Here, then, is the combined error of commission and omission, with incorrect or missed diagnosis, prognosis is a forlorn hope. Apart from accident, the cause of sudden, unexpected death is myocardial, being the result of angina of effort, a painful coronary occlusion, a more or less painless fatty or fibro-fatty degeneration of the heart muscle, or a rupture of the left ventricle beginning at the origin of the aorta then extending backwards into the heart muscle for an inch and more. Whilst aortic regurgitation is another cause, the condition is usually of some standing, a sudden ending to life having been long expected by those aware of its existence.

In a *bed patient*, it is of first importance to gauge the bodily strength and vitality which are being undermined by superadded disease. To arrive at any estimate, apart from the question as to whether the myocardium, functionally spent as it may be, is sound or unsound structurally, the following is significant—the decubitus and attitude in bed, if supine, sinking into the well of the bed, unable to turn himself from side to side, with expressionless face, with *flocitatio* and *subsultus tendinum*, he is within hours of his end. The words of Shakespeare on the death of Falstaff (Henry V, Act II, Scene 3) reveal an advanced stage of exhaustion—

"For after I saw him fumble with the sheets, and play with flowers, and smile upon his fingers' ends, I knew there was but one way, for his nose was as sharp as a pen, and 'a babbled of green fields."

Other signs of failing vital strength are cyanosis, livid pallor, a racing, disorderly pulse, hurried and irregular breathing, a voice weakened and altered in tone, increasing helplessness, extreme emaciation, and dehydration. The *facies Hippocratica*, even taken alone, is of grave significance, the cause of this condition lies partly in inanition, chiefly in lack or loss of fluids. This state is described in *Le Morte D'Arthur* in book 21, chapter 12, Malory wrote of Sir Launcelot—

"Then Sir Launcelot never after ate but little meat, ne drank, till he was dead. For then he sickened more and more, and dried, and dwind away. For the Bishop, nor none of his fellows might not make him eat, and little he drank, that he was waxen by a cubit shorter than he was, that the people could not know him."

Dehydration accompanying disease may gravely prejudice recovery and, if extreme, can itself destroy life.

Blood pressure—A prolonged drop in the level of blood pressure is evidence enough of failed vitality. Pressures persistently low may indicate poor staying power, with a low resistance in illness. This appears to be so in the neurasthenic with the usual accompaniment of low blood-pressure, the sufferer is usually the cyanotic person, and the two conditions commonly "hunt in couples." The environment of the sick-bed should be noted, the ventilation of the room particularly, whether ample or not. I recall the steep fall in death rate in secondary broncho-pneumonia in children at Edinburgh after the late Claude Kerr had the windows of his ward taken out for good.

In a certain number of persons, a *latent strength* exists unsuspectedly. Here is another reason for circumspection. In looking for this, it is well to learn the age at death of the patient's parents and grandparents. Some hint of it may be obtained, if uncertainly, from retained strength of voice, muscle power, and capacity for enough sound sleep. A tremulous, hollow, whispering voice is a bad prognostic

sign, to be able to sleep soundly and well is a good prognostic sign. In illness, failure to sleep with perhaps a quiet delirium, steadily exhausts and soon kills. When estimating bodily strength, it is well to recall the words of Ecclesiastes (IX. 11)—

"The race is not to the swift, nor the battle to the strong, but time and chance happeneth to them all."

If some fall short of their expectation of life, there are others who, though burdened with years or sickness, or both, are so tenacious of life as to outlive all expectation.

VARIATION IN TYPE TERMINAL PHENOMENA

As to the disease itself it is of some advantage to adhere to the division into inflammations, new growths and degenerations, and to use the three categories—acute, subacute and chronic. Acute illness is expected to last fourteen days, more or less, and will include visceral inflammations, with effusions, perforations and hæmorrhages, also poisonings and some infective fevers. The subacute may last three months, often much longer; and the chronic type, embracing blood diseases, malignant neoplasms, structural degenerations, and slow auto-intoxication or functional failure, as in metabolic disease, much longer still. Consecutive mergings of these three types are, of course, common, although each by itself is well enough definable. A study of accurately kept temperature charts is of help in determining the type and the nature and severity of toxæmia. In chronic diseases, a usual ending is by exhaustion, with intercurrent trouble, such as a hypostatic pulmonary congestion, to carry off the patient. The word chronic, it is better to use sparingly, if at all, in the presence of lay people, it being too often taken as synonymous with "incurable", similarly, the words "cure" and "incurable". The fact of having employed them may later be used in evidence against the conscientious medical man. Such a classification is an aid to conciseness, at least it obviates some of the vagueness that surrounds the question of "day of disease" and likely length of illness.

Nature is often disclosed to the medical practitioner by fits and starts, so that care has to be taken not to overlook new signs which reveal themselves from hour to hour and day to day to warn of coming events. In hyperpiesia, for example, a diastolic blood pressure of 130 mm Hg or over, with a systolic pressure registering 200 and more, is ominous to a greater degree in the presence of renal disease (hyperpiesis), giving timely warning of threatening cerebral vascular catastrophe, over-stressing of the heart, or uræmia. In this contingency, to foresee these severally at close range, each gives notice as it were of approach to its natural ending. In the first case, hypertensive attacks or retinal hæmorrhages may happen, in the second, attacks of dyspnœa, or of auricular fibrillation lasting hours or days or longer; and in uræmia, if albuminuric retinitis appears—this, in 90 per cent. of patients suffering therefrom, augurs death within two years of diagnosis—or, if raised hissing respiration, persistent vomiting with vague abdominal pain, convulsions or coma occur, then final failure of the kidneys looms in sight, become imminent when the blood urea measures over 200 mgm per 100 c.

To find terminal signs, points to a bad immediate prognosis—such are—Cheyne-Stokes breathing, a respiratory rate of 40 or over; failure and disappearance of the cough reflex, a racing pulse in serious disease of 130 or more, particularly if attended by other signs of circulatory failure, such as irregularity in rhythm and force of pulse, falling blood pressure, a pallid cyanosis of ears, fingers and toes, extensive dropsy beyond control, and increasing general weakness. Final circulatory failure is a mode of death commonly seen in bedside practice, sometimes ascribed wrongly to a failure of the heart. Another end-sign is a deepening coma, from whatever cause. All these point to an illness nearing a fatal close, although even then the occasional recovery is not unknown, and they embrace Bichat's three different modes of death—by heart, by lungs, by brain.

THE PROFESSIONAL ATTITUDE

In the presence of grave illness, subtle shades of bearing and meaning should be avoided, no more ought to be meant than meets the eye or ear, a patient, perhaps more so a relative, is quick to read the practitioner's face or hesitant mode of speech as belying the opinion he expresses. Sometimes sensitive people feel an immediate dislike, or fear, of the stranger brought as consultant to the bedside. To be cheerful and hopeful in the presence of the patient is prudent and, without being fanciful, it is possible to be convincing as well as cautious in statement. When a favourable prognosis is permissible, the practitioner does well to guard himself by adding, as Sir Robert Hutchison has wisely advised "provided there are no complications." In some instances a half-truth is better than none, or, in the words of a favourite Greek maxim "the half is often better than the whole", but whatever is sincerely believed can be explained so as not to mislead or to deprive of hope. Although to be forthright and dogmatic may be persuasive, the practitioner should, at the same time, avoid loose defining and must not dissimulate. To be confused in words and rambling in thought will create a bad impression, and the appearance of reticence suggests that something is being hidden, though often enough the less said the better. It is well to speak in time, the moment may be fleeting and the opportunity to speak missed, on the other hand, a slow death agony speaks for itself.

With all the care in the world, no prediction of the course of events can be accurate. Any medical man will, of course, recall instances when chance rather than reason prompted a correct prognosis. To predict what is going to happen in illness is perhaps more art than science. The academic mind sees with the eye, the practised artistic mind sees *secundum artem*, intuitively—with the inward eye. After sentence is passed, even if it be adverse, a patient may become tolerably resigned and sleep soundly. With hope receding from day to day, conscious of his weakness and of the impermanence of all human things, he may himself have begun to await the final curtain, tranquil in mind and spirit, for "where no hope is left, is left no fear." Attachment to life may be loosened in direct proportion to the shrinking value to the patient of the gift of living brought about by illness, so the will to live weakens and goes. Then again, in exhausting illness,

especially in the elderly, a stage may be reached when, having ceased to watch the moments next to come, all thoughts and things that make life liveable become cancelled and blotted out one by one, when by reason of much suffering the world becomes old and stale, a renewal of life is no longer hoped, or even wished, for

To compare cases leads to no end, it is in fact useless, each should be viewed according to its own merits and as a person who is sick rather than as a case. To a relative, especially to a wife as nurse, the truth must be told, even if bluntly; yet this can be softened by being couched in suitable terms. Often a sentence satisfies and is enough, usually little more is needed, and if to one old to the way of medical practice falls the telling, this may be so expressed as not to give pain or offer too disheartening a prospect. In a few, after taking every thought and care in treatment, the outlook may be of the gravest. Then, it is hard to stand by and watch death make sport of our best efforts, to find our limitations, even our misjudgements, bear bitter fruit, and the world made desolate and empty to those bereft.

CONCLUSION

To determine the duration of an illness with the mode and manner of its ending, is not possible by any exact method or means, nor is it always easy or even possible to assign the specific grounds for an opinion advanced. The most that can be hoped for is to secure evidence enough with which to form an opinion that is well founded. Prognosing is a duty laid upon the medical practitioner which has to be faced, no matter how baffling the problem may seem to be. Signs to go upon may be few or more which, and where in importance, to place in the picture will depend upon experience and the use of clinical common sense. With this critical matter to discuss, though each may form an opinion of his own, two heads are often better than one. There is another side to the picture the old proverb "*Non medicamen sed medicus curat*" has a live significance, it has been well said that it is only through sympathy that we can get into living touch with another soul. Because the practice of curative medicine is of its essence a personal thing, the practitioner should reject the modern tendency to become too impersonal. The blessed words "you are going to get better" gratuitously offered inspire courage and hope, sometimes almost past belief. It is surprising how high a faith is placed in the medical man, how much confidence his words may give.

If the pessimist as consultant is a failure, the super-optimist, being over-sanguine, may unwittingly add to the practitioner's burden of responsibility and difficulty; the consultant's words may even be cast back at him afterwards, then all is vanity and vexation of spirit. The right attitude of mind to adopt is one of optimism should the outcome prove contrary to what was anticipated, the optimist is rarely held to be blameworthy. The consultant, however, will only deceive and wrong himself and everybody else if he thinks one thing and says another.

"Life is short, the Art is long, occasion sudden, judgement difficult"

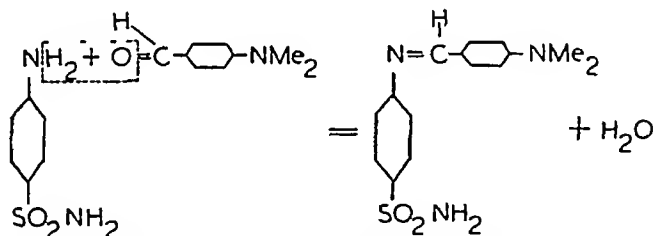
COLOUR TEST FOR SULPHONAMIDES: A BRIEF HISTORICAL NOTE

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EHRlich in 1901 noticed that one of his synthetic preparations, paradimethylaminobenzaldehyde, gave a red colour with certain urines. Two years later Neubauer showed that this was due to urobilinogen. The test has since then been known as the aldehyde reaction. It is made by dissolving 3 gm of the yellow aldehyde powder in 100 c cm of 20 per cent hydrochloric acid. Chase (1912) commends it as a test for hepatic insufficiency and Nesbitt (1913) supports this statement. Hunt (1936) speaks highly of it as a test for early cirrhosis of the liver and considers that it deserves a wider application in England than it has received.

Stimulated by Hunt's suggestion, it was decided to carry out a series of observations on urines in the Royal City of Dublin Hospital. During this investigation it was noticed early in 1937 that the urine of patients taking sulphanilamide gave in many cases, on the addition of the reagent, a dense orange precipitate, whilst in others a yellow colour was obtained. The specimens were submitted to Dr Emil Werner, Professor of Chemistry in Trinity College, Dublin, who stated that the reaction was due to the formation of a condensation product with the elimination of water.



Sulphanilamide + *p*-Dimethylaminobenzaldehyde = *p*-Dimethylaminobenzylidene-sulphanilamide

It was thought that it might be possible to ascertain the concentration of the drug by weighing the precipitate and solutions of known strengths of sulphonamide to which Ehrlich's reagent had been added, these were given to Werner, who determined the weight of the precipitate. The results were not consistent and it was clear that the gravimetric method was impossible when only a colour change was produced. The attempts, however, proved conclusively that the precipitate and the colour were due to the sulphonamide.

Werner (1939) subsequently devised a colorimetric method which is now extensively used and has many advantages over the older method of Marshall and his co-workers. His aldehyde solution consists of 3 gm of the dye dissolved in

100 c cm of distilled water containing 7 c cm of concentrated sulphuric acid. As standards he uses a series of dilutions of 1 per cent solution of potassium chromate, the colour of which agrees with concentrations of sulphanilamide ranging from 0.25 mgm to 1.3 mgm per 100 c cm. By this means he has a set of standards the colour of which is permanent. The method is simple, rapid, and sufficiently accurate for clinical purposes. It does not require any elaborate apparatus—a simple comparator is sufficient.

Peters (1944) has described an easy and accurate method for the determination of sulphonamide from a drop of blood. He states that his method is based on a discovery by Kühman in 1938, who found that Ehrlich's reagent for urobilinogen produced a yellow dye if added to sulphonamide. Churg showed that alcohol increases the intensity of the yellow colour to such an extent that the reagent may detect 1 part of a sulphonamide in 20,000,000 parts of fluid, and the presence of urobilinogen in the urine or blood in no way interferes with the test, because the colour due to urobilinogen is fifty times weaker than that due to the sulphonamide. Peters uses as his reagent a 2 per cent solution of the dye in 95 per cent alcohol and as his standards a series of dilutions of known strength of sulphonamide to which the reagent has been added, as in his opinion the colours can be more accurately matched than with potassium chromate. The solutions are not very stable and must be freshly prepared at short intervals.

Promin, one of the most recent members of the sulphonamide group, has been estimated both in the blood and urine by Werner (1944), using the same method he had introduced for sulphonamide, but the potassium chromate standards are not applicable.

CONCLUSIONS

Ehrlich's paradimethylaminobenzaldehyde gives a quick and accurate method for detecting the presence of any of the usual sulphonamides in the blood, urine, or other organic fluids.

If, in testing urine, an orange precipitate is obtained it is probable that the drug is present in the urines in a concentration of about 0.1 per cent. Its gradual elimination may be daily watched as the yellow colour becomes less and less pronounced. In some cases twelve to fourteen days elapse after its last administration before all traces have disappeared. From the clinical point of view, the test is accurate, easy of application and inexpensive. An experience of over seven years of its use in the Royal City of Dublin Hospital fully justifies its recommendation.

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those children shall be treated in the school clinics for whose treatment adequate provision cannot otherwise be made, whether by the parents or by voluntary associations or institutions, such as hospitals, or through the Poor Law " To the present day, parents are given the chance of making their own arrangements for treatment, but most of the specialist and minor ailment treatment is undertaken at the school clinics, as hospitals in the early days desired relief from large (and unruly) additions to their out-patient departments There is an added advantage to this procedure, as complete records can be kept and the child can be "followed-up"—a marked feature of school medical work—until recommendations and treatment have been completely carried out Needless to say, medicines are not prescribed or dispensed at the school clinics, and domiciliary treatment is not undertaken by school medical officers

BASIC PRINCIPLES

The foundation of the school medical service continues to rest on the periodic inspection of every school child, on admission to school and at the ages of eight and thirteen years (At secondary schools, on entry, at twelve and fifteen years, and in the leaving year It may be stated here that the provision for treatment facilities, in some areas, for secondary schools do not coincide with those existing for the elementary schools) The results of these examinations are entered on a separate schedule for each child, containing in all cases a minimum number of headings suggested by the Board The particulars have been elaborated in some areas, but, as the original accompanying circular stated "If this schedule is properly used, few cases of serious physical weakness or defect will escape detection," the findings should give a satisfactory clinical record It may be that a standard schedule will be issued which will have regard to the experience accumulated during the intervening years To those engaged in treatment of the sick and ailing, the value of examining apparently healthy children is not always obvious It is necessary to cultivate the approach which is being stressed in increasing measure, enunciated at the beginning of the service but which was, in the main, lost sight of in the enormous number of defects then discovered The medical officer must discard his pathological outlook and assume an approach which has as its aim the maintenance of the general well-being of the school child, in supervision and management The educational and social factors, relating to the child, must also be considered

PROCEDURE OF MEDICAL INSPECTION

With these considerations in the forefront, attention can be turned to the medical inspection The medical officer has the assistance of the school nurse at these inspections, who ascertains the height and weight, reports on the child's state of cleanliness, removes the clothing to the hips, and takes off the shoes and stockings It is fortunately the custom to summon the parent to the examination, and the attendance is always satisfactory at the entrants' examination at least At the latter examination, a record of the salient features relating to the child's attendance at the child welfare centre is generally present A complete examination is made, but attention may be drawn to the use of the electric otoscope, to the examination of the posture of the child and to the condition of the feet

A present requirement is the estimation of the state of nutrition, and the nature

of the returns has caused many arguments. The "normals" always represent a high proportion (England and Wales 1938—74.2 per cent.), and it is suggested that this represents the average nutrition for this class of children, and in no way represents the optimum. The remaining classifications are "excellent," "slightly subnormal," and "bad."

The height and weight are entered on a schedule at the inspection, but these measurements are not particularly helpful guides. Many authorities arrange for half-yearly measurements to be charted, and the graphic representation is then a helpful indication of the child's progress.

Any defects discovered are noted for either treatment or observation on the records, in accordance with the system elaborated by the authority. A pamphlet containing notes on local arrangements is generally available, and is intended to facilitate administrative procedures.

At the conclusion of the examination of the children who fall into the periodic age-groups, the children who have been found with any defect during the different types of examination on the previous visit are presented for re-examination and further consideration. Other children not in these groups may be examined as "specials," when the parents or teachers ask for an examination and advice. In many areas, the medical officers then visit the classrooms for a survey of the remaining children, with special regard to the evidence of the continuous height and weight charts. Here, the attendance register may give a lead to inquiries which can be most productive. Ideally, each school should be visited once a term, so that the children have the benefit of a continuous survey. The medical officer is also expected to make a report on the general and sanitary condition of the school premises, including kitchen and canteen, if present. This duty may not be agreeable but, if pursued with interest, many recommendations can be made which bear directly on the health and training of the scholars. For example, the medical officer advises on such matters as the effect of desks on posture and the suitability of lighting. It is as well to remember that it was through the efforts of medical officers that the newer school buildings are so near the ideal.

INSPECTION CLINICS

Turning to the many aspects of school clinic activities, emphasis can be given to the Inspection Clinic. Here, in the words of the Chief Medical Officer to the Board (Newman, 1922) —

"the School Clinic is the *Health Centre* for children of school age. Parents and teachers, whose interest in the health of the children has been stimulated by the school medical work, often become anxious when they notice that a child is 'not up to the mark' at school, and are glad of an opportunity to consult the School Medical Officer. But these conditions cannot be investigated in school, time, quiet, adequate lighting, opportunity for detailed inquiry are necessary for such purposes, and can only be obtained by the establishment of a properly equipped centre. Hence the 'Inspection Clinic,' where the attempt, by wise counsel, to check the beginnings of disease, and to re-establish a normal condition of health constitutes one of the most valuable activities of the School Medical Service."

The value of this section of the work cannot be over-estimated. Parents have increasingly taken advantage of this consultative service, where advice relating to nurture in the wider sense can be given.

TREATMENT CLINICS

MINOR AILMENTS AND DISEASES OF THE SKIN—Possibly the need for facilities for the treatment of these conditions amongst school children is not fully realized, as they do not generally come to the notice of the general practitioner. Although adequate provision may reduce the incidence of certain diseases, such as ringworm of the scalp, at the same time the facilities bring large numbers for treatment. Some of the conditions which are treated by the school nurses, under the direction of the medical officers, may be indicated. The skin diseases include types of pyoderma, such as impetigo, boils, abscesses and whitlows. Other conditions are intertrigo, chilblains, herpes, ringworm of the body, eczema, pityriasis, cuts, bruises, burns and scalds.

Ringworm of the scalp was prevalent in the early days of the school examinations, but with regular inspection, and the use of X-rays for treatment, the condition is infrequently seen at the present time. The diagnosis is settled by removing a typical diseased hair—a short broken thickened “stump,” generally found in a dry scurfy patch—and examining the specimen in the usual manner under a microscope, when the spores can be quite easily seen. The condition can also be diagnosed by using a Wood's screen fitted to a mercury vapour lamp, when the affected hairs will fluoresce. This is a particularly useful method when only a few hairs are infected, or when a doubt exists concerning a complete cure.

Cases of *alopecia* are also seen and may present some difficulty in diagnosis. The “note-of-exclamation-mark” hairs are, however, different from the stumps in ringworm. It may also be noted that ringworm of the scalp is hardly ever seen after puberty.

Scabies has become very prevalent of late years, and as a rule arrangements are made through the Public Health Department for treatment of all the infected members of the household.

External diseases of the eye are treated at the Minor Ailment Clinics, and do not call for any special comment except for one reminder. All cases of phlyctenular disease should be sent to the tuberculosis dispensary for investigation.

VISUAL DEFECTS—Refraction of children with defective vision forms a large section of the treatment given by the service. Most authorities employ ophthalmic surgeons and, in some areas, school medical officers who have had special ophthalmic training assist with refraction and the prescribing of spectacles. In all cases, the children are re-examined at suitable intervals. The names of the children who have obtained spectacles are notified to the head teachers of the schools concerned, and school medical officers see these children when visiting school.

The *treatment of squint* is also undertaken by many authorities in an orthoptic department, under the supervision of the ophthalmic surgeons. Orthoptic treatment is a comparatively new development, and practitioners may not appreciate that the training of the child takes a long time. Parents sometimes need encouragement to continue bringing the child to the clinic, and in this connexion the family practitioner can play an important part, especially as it has been said that “the treatment of squint in an effective manner might very well be taken as a measure of the grade of the civilization of a people.” The treatment of squint may be conveniently grouped into these divisions—(1) Examination to determine

primary cause, the correction of any error of focus with glasses, and restoring the sight of the squinting eye by covering the good eye, (2) special exercises to revive the function of binocular vision are then undertaken by the orthoptists, (3) operation may also be necessary in some cases

ENLARGED TONSILS AND ADENOIDS—Provision for the treatment of enlarged tonsils and adenoids is made by most authorities, sometimes through the local hospital. In such areas, practitioners should refer the children to the school medical officer, so that confusion may not arise over responsibility for the requisite payment to the hospital concerned

The clinical indications for tonsillectomy are by no means clearly defined, and in recent years a critical attitude has been maintained before recommending a child for operation. Where an authority has a scheme, a child must be examined by the operating surgeon on an occasion prior to admission to hospital. Glover (1944) describes the incidence rate in recent years, and the differences in various areas. Evidently the lowest rate was in 1934, following vigorous criticism of the frequency of tonsillectomy. The total gradually rose again to fall in 1940, but evidently the number is again rising

EAR CONDITIONS—The minor conditions are treated at the Minor Ailment Clinic, but when resistant or more severe conditions are encountered the cases are referred to the aural surgeon at the Aural Clinic. Details of treatment can be given and carried out by the school nurses, specially trained in the technique, at this clinic or at branch clinics, under the supervision of the school medical officers, in the case of the larger authorities. Treatment by zinc ionization is sometimes employed in selected cases of otorrhœa

Hearing tests—Many authorities systematically test the hearing of school children in the same way as visual acuity is regularly ascertained, and those found to be deaf are referred to the aural surgeon

The routine testing is best carried out by means of the *gramophone audiometer*—

A record is used for this instrument, which reproduces the human voice speaking a series of numbers, according to a scale of decibels, the intensity of the sound diminishing steadily, as though the speaker were moving from the hearer. Each ear is tested separately by means of an earphone, and forty children can be tested simultaneously. The child writes the figures heard on a special form after appropriate instructions have been given. The Cowan picture frames are used for younger children. A second test is given to those children who fail to reach the nine decibel level, and on further failure they are referred to the aural surgeon for examination and treatment

When the defect of hearing is severe, the *pure tone audiometer* is used for individual testing—

This instrument produces pure tones at frequencies (or pitch) throughout the auditory range, which can be heard by either air conduction or bone conduction receivers. The child's hearing capacity at the various frequencies can be tested from low to high pitch, as each can be varied separately in degree of intensity. The extent and character of these measurements of the child's "residual" hearing can be plotted on a special chart which is known as the audiogram, and is of great value in diagnosis and treatment

SPEECH DEFECTS—Treatment for speech defects is being provided for by increasing numbers of authorities through speech therapists. The value of this form of treatment can be readily appreciated, but the types of defect dealt with are perhaps not clearly understood. The commoner types treated through the school medical service have been recently classified and described (Henderson, 1944)

Stammering —Most investigators consider this to be a nervous disorder and not a speech defect. Though not hereditary, there is in most cases a predisposition to stammer, the onset being due to some shock, strain, or illness. Sometimes, in children already predisposed, it may be due to irritation, in other cases stammering may be the emotional reaction to the consequences of an initial speech defect.

Defects of articulation —These may be organic or functional in origin. The following can be briefly noted —

Dyslalia	defective pronunciation of consonants. In <i>lisp</i> ing the sibilants— <i>s</i> <i>z</i> —are replaced by the sound <i>th</i> . In <i>lalling</i> <i>L</i> is substituted for <i>R</i> .
Rhinolalia	nasal speech
Cluttering	hurried jumbled speech
Idioglossia	articulation is so defective that the individual appears to have a language of his own

Defects due to deafness —In some cases of defective speech due to high frequency deafness, which can be ascertained by means of the pure tone audiometer, effective help can be given by speech therapy. The cooperation and help of a physician, a neurologist, an aural surgeon, a dentist, or a child guidance team, may sometimes be required, and coordination is effected through the school medical officer.

DENTAL TREATMENT

Dental inspection is carried out regularly and systematically in all schools, and full treatment is offered. There is still some reluctance, however, in accepting these facilities, especially conservative treatment. The object of the school dental service is to preserve teeth from decay, to care for children throughout their school life and send them out into the world with clean mouths and efficient teeth. Unfortunately, however, the acceptance rate for England and Wales for 1938 (the last available figure) was 60.6 per cent. It is hoped that continued educative means through teaching provisions, and special stimulating visits of demonstrators provided by the Dental Board of the United Kingdom, will help to increase the desire for dental care.

Orthodontic work is undertaken by only a few authorities directly, and reference is generally made to agencies undertaking this type of dental treatment.

LIGHT TREATMENT

The value of artificial sunlight treatment, when used with discretion, is unquestionable, and the beneficial results of such treatment have been recorded regularly by the authorities who have provided light clinics.

ORTHOPÆDIC DEFORMITIES AND POSTURAL DEFECTS

Orthopædic schemes arrange for early ascertainment, in-patient treatment at hospitals for "short-stay" cases and at hospital schools for "long-stay" cases, together with continuous after-care at the Orthopædic Clinic. Here the orthopædic surgeon can keep such children under observation, arrange for any further treatment which may be necessary, supervise the suitability of splints and appliances, and examine new cases. Fully qualified physiotherapists are responsible for such treatment as remedial exercise and massage, which may be recommended by the surgeon. Suitable premises and equipment are available for these purposes at the clinic. It need hardly be stated that the local authority assist in the purchase of all

necessary orthopædic appliances when required. Early ascertainment of defects is, of course, important to secure good results, and it is gratifying to note that full use is made of the Orthopædic Clinic in this respect.

CARDIO-RHEUMATIC DEFECTS

The school medical service is not directly responsible for the treatment of acute cases of rheumatism, but it is desirable that the authority should maintain a hospital recovery school where the children can convalesce immediately following the acute stage. Suitable care and management under expert advice, with the aid of a trained nursing staff, regulate the patients through the various grades of activity. In addition, appropriate education is given by qualified teachers.

The Cardio-Rheumatic Clinic is complementary to the treatment at the recovery hospital school, since suitable children seen at the clinic can be nominated for this school and complete "follow-up" on discharge can be effectively procured at the clinic. Here also, accurate diagnosis of suspected heart conditions can be undertaken. Heart murmurs are discovered at the school inspections, which call for expert and critical assessment. At this special clinic, these can be differentiated, and the child who is suffering from a minor congenital cardiac defect or functional murmur is saved from a restricted school life and possibly imposed invalidism.

The examination of the majority of these children by the same medical officer in the early stages of the disease, during their treatment in the acute stage at the hospital, through their convalescence at the recovery hospital school, and the "following-up" at the clinic, is a characteristic which must be stressed.

PROVISION OF MEALS AND MILK

The provision of free meals to children to enable the recipients "to take full advantage of the education provided for them" preceded medical inspection. The Education (Provision of Meals) Act was passed in 1906, and although it has been referred to as smacking of the Benthamite principle of utility, there can be no doubt that, wisely applied, the provision of such meals prevented severe malnutrition. In 1940, however, the Board issued Circular 1520, which recommended the provision of mid-day meals on payment for every child whose parents wished to take advantage of the service. The arrangements for school meals were pressed forward so that in February 1944 it can be noted (Cmd 6530) that a number of authorities were providing dinners for over 40 per cent of the children. The nutritional benefit derived from planned meals at the school canteens indicates marked progress in preventive principles. The educational and social advantages are also of great value, and a further pleasing feature is that no distinction is made between children who are receiving free meals and those who pay.

Milk had been provided in some schools through the individual efforts of teachers for some years, but it was not until 1934 that the milk-in-schools scheme was instituted through the Milk Marketing Board. The scheme was taken up with enthusiasm by the teachers and, as the nutritional value of milk is high, it is gratifying to note that at the present time between 60 and 90 per cent of the children are receiving milk in school (Cmd 6530). Milk, as with meals, is supplied free on medico-economic grounds.

CONTROL OF INFECTIVE DISEASES

Any child suffering from an infective disease should of course be excluded from school, and the various periods are indicated in the Memorandum on Closure of and Exclusion from School, Ministry of Health and Board of Education 1942. In the case of certain diseases the children are sometimes examined by the school medical officer before re-admission. The period of quarantine for home contacts has been considerably modified in this Memorandum, in the light of experience. In certain conditions the home contact is allowed to attend school, and is kept under observation during the incubation period of the disease. If any symptoms appear, the child is of course promptly excluded, but it has been found in practice that these cases are comparatively rare. Similarly, modern trends have eliminated the needless wastage of school attendance in dealing with class contacts. Even in an epidemic, or when infection spreads in spite of the exclusion of affected children, closure of a class or school is possibly only indicated in a rural area. In an urban area, closure may only bring the children into closer contact under unfavourable conditions. I have personally observed that a cinema opened with special afternoon performances when the schools had been closed! The class contacts can remain in school under medical observation, and search, according to recognized epidemiological principles, should be made for mild or unrecognized cases.

The school medical officers have given effective aid in carrying out immunization against diphtheria.

MEDICAL SUPERVISION OF EMPLOYED SCHOOL CHILDREN

Local authorities are empowered to make by-laws regulating employment outside school hours for specified periods in certain occupations. Licences are granted contingent upon an examination by the school medical officer certifying that the employment is not prejudicial to the health of the children.

PHYSICAL EDUCATION

The medical officers cooperate closely with the instructors over the scheme of physical education in the schools. In addition, individual reports are made on children specially submitted for an opinion, or when noted during medical examination, as to their suitability for various types of physical activities.

HEALTH EDUCATION

A well-planned syllabus for the school teacher is contained in the "Handbook of Suggestions on Health Education," 1939, issued by the Board. Whilst the medical officer does not take part in the actual teaching, he should be aware of the contents and take an interest in its presentation. The hygienic training of the child by "the inculcating of the laws of health" and "training in right habits and conduct" forms an important part of the work of the school medical service.

Cleanliness—Systematic cleanliness inspections are carried out regularly by the school nurses or auxiliaries. The standard reached falls short of the ideal, and the relevant difficulties have been well set out in "Our Towns" (1942).

COOPERATION WITH NATIONAL HEALTH INSURANCE PRACTITIONERS

Since 1938, practitioners are able to apply for the school medical history of juvenile contributors who come on to their panel. This cooperation has been accepted willingly as a signal opportunity for a continuous medical record. Unfortunately, however, only proportionately few such requests have been made.

PROVISION FOR SPECIAL GROUPS OF CHILDREN

It is the duty of school medical officers to ascertain children who are blind, deaf, physically or mentally defective or epileptic, so that provision can be made for their care.

OPEN-AIR SCHOOLS

It has been well said that the open-air school is not merely a school in the open air; it comprises a way of life and a system both of educational and medical supervision, characterized by fresh air and sunlight, a proper and sufficient diet, healthful and adequate rest, and a hygienic way of life, from regular bathing to participation in formal physical training.

The following classes of children are especially likely to benefit from attendance at open-air schools (day or residential) —

- (a) Cases of subnormal nutrition, malnutrition, rickets and anæmia.
- (b) Delicate children living in the same house as a consumptive.
- (c) Children with tuberculous glands in the neck.
- (d) Convalescents from debilitating diseases, such as pneumonia, measles, whooping-cough.
- (e) Convalescents after operations for adenoids or enlarged glands in the neck.
- (f) Cases of blepharitis and other chronic non-infective diseases associated with malnutrition.
- (g) Certain types of cripples, nervous and highly strung children.
- (h) Children who have returned from a sanatorium school and are not yet fit for an ordinary public elementary school.

BACKWARDNESS, DULLNESS, AND MENTAL DEFECT

Intelligence tests — Some knowledge of educational psychology is essential for work in the school medical service. Intelligence is distributed in a normal sample of the population in a regular manner. Amongst school children, standardized tests of intelligence have been carried out by means of revisions of the famous Binet-Simon tests and the distribution, in the main, is much the same for different parts of the country. The result for an individual is stated in the form of an intelligence quotient (I Q) which is found by dividing the mental age (discovered by the test), by the chronological age of the child, and multiplying the result by 100. In any large sample of the child population it will be found that roughly 60 per cent are of average intelligence with I Q's between 90 and 110, and approximately 15 to 20 per cent will be "bright" children with I Q's above 110. On the other side of the scale are the remaining 20 per cent below the 90 I Q level. Dullness is arbitrarily recognized as lying between the 70 and 90 I Q, accounting for about 15 to 18 per

cent. The class known as educable mental defectives requiring special methods of education in their own interest lies between 50 to 70 I Q and forms between 1 to 2 per cent of the child population. Below the 50 I Q level in decreasing intelligence are the imbeciles and idiots

It must be emphasized that the demarcations are not rigid, but with this proviso it can be said that a child falling into any one of these broad educational classifications will always occupy the same category. The inherently backward child is of course medically untreatable, and it is of no avail to comfort the mother with the statement that the child will "grow out of it". The dull child requires special education in the structure of the elementary school, and the mentally defective child in a special class or school for his own benefit, and the parents should be helped to appreciate this educational provision. Reliance can be placed on the diagnosis, as the examinations are only undertaken by medical officers who have been specially trained and approved by the Ministry

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CHILD GUIDANCE CLINIC

A comparatively recent development in the service, the Child Guidance Clinic, has as its aim the investigation and treatment of children with the following problems —

- (1) Nervous disorders, comprising such conditions as fears, shyness, depressions, emotional instability, day dreaming
- (2) Habit disorders, comprising such conditions as speech, sleep and food disorders, restlessness, incontinence
- (3) Behaviour disorders, comprising such conditions as unmanageability, temper, aggression, truancy, delinquency
- (4) Intellectual difficulties, comprising such conditions as educational retardation, special disabilities and educational guidance

Children suffering from mental defect are not treated at the clinic. The list is given in detail, as the work of the clinic is not sufficiently well known to practitioners. It is an integral part of the medical and educational service when maintained by a local education authority. The process of tracing these problems to their roots is often complicated, and usually entails a number of investigations. A complete physical examination is made and, if necessary, the child is referred for a specialist opinion at a children's hospital. The problem may then be investigated by all the members of the team at the clinic, which consists of a psychiatrist, a psychologist, and a psychiatric social worker. The psychologist undertakes the testing of intellectual and educational abilities, and, in certain cases, treatment. The psychiatric social worker makes a study of the child's home environment and of the personal relationships which exist between the child and his parents.

Full discussions take place between the team, in order to arrive at the best line of treatment for the child. It is not possible to describe here the different methods adopted, but this brief account may show there is no mystery surrounding the investigations undertaken at the clinic

THE DEAF AND PARTIALLY DEAF CHILD

Education in a school for the deaf is arranged for the totally deaf children and those children whose hearing is so defective, and whose speech and language are so little developed, that they require education by methods used for deaf children without naturally acquired speech or language. Partially deaf children who, even with the help of favourable position in the class, individual hearing aids or tuition in lip-reading, fail to make satisfactory progress in ordinary classes in ordinary schools should be taught in separately organized schools.

THE BLIND AND PARTIALLY SIGHTED CHILDREN

Children who cannot be taught by methods involving the use of sight are accommodated in residential schools for the blind.

Partially sighted children are those with a visual acuity of $\frac{6}{24}$ or worse after correction with spectacles, and who can see well enough to be taught by special methods involving the use of sight. They are generally educated in special classes with suitable equipment in an ordinary school, so that they can join with the rest of the school in both work and play, subject to any restrictions imposed by the ophthalmic surgeon. About two-thirds of these children suffer from progressive high myopia, and the remainder from congenital or hereditary defects, and from the results of inflammatory conditions.

EPILEPTIC CHILDREN

When the fits are severe and occur frequently during the day, the child is excluded from the ordinary school and sent for special education in one of the colonies for epileptic children.

CRIPPLED CHILDREN

Treatment in a hospital school for orthopædic and rheumatic conditions has already been described. Special schools, either day or residential, may be indicated after discharge, and the curriculum and equipment are adapted to their needs.

CONCLUSION

Ryle (1944) has recently summarized the value of the school medical service and it is fitting to conclude with his words—"School meals and other amenities have helped to produce significant improvements in the physical, mental and moral growth and stature of elementary-school children, and have brought them nearer to a state of 'wholeness' than was possible for the children of earlier generations."

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NOTES AND QUERIES

YOHIMBINE IN THE TREATMENT OF FUNCTIONAL SEXUAL IMPOTENCE

QUESTION (from a practitioner abroad) — I have been trying since December of last year to obtain some preparation of yohimbine for a case of functional sexual impotence. I will be much obliged if you can give me the name of a producer to whom I can apply with the hope of a certain amount of success. As I have not had much experience with this preparation, I should much appreciate it if some indications could be given to me as to — (1) The best form of preparation to administer; (2) the dose and mode of administration, and (3) how long the treatment should be persisted with before it is given up as unsuccessful or, if successful, to obtain the best results.

REPLY — Yohimbine is a drug which is difficult to get at the present time. The only preparation that I know of is made by Knoll in tablets of 1/13 grain. One of these tablets should be given for two days before the intended intercourse. It should not be taken as a routine medicine for two or three weeks at a time. Some authorities recommend that each tablet of yohimbine should be combined with 1/20 grain of strychnine. Yohimbine should never be given in any case of heart disease. The drug must, however, be placed amongst the placebos, because it is only in the rarest cases that it appears to have any beneficial effect, and this is probably psychological. There is, however, a new drug which is far more efficacious, and that is methyl testosterone. This can be prescribed in several ways —

(1) By injecting 25 mgm into the buttock twice a week. This may occasionally be pushed up to 50 mgm, but in giving these larger doses it is important to see that there are no undue symptoms of strain, such as rapid increase in weight or feelings of lassitude. The treatment in adults seems to increase sexual activity so that the individual experiences stronger and more frequent erections and increase in sexual feeling. It also has a definite action on sexual development in younger adults, in which case it must be given with extreme caution. If it is administered too early it may cause closure of the epiphyses. There are several proprietary preparations on the market, of which perandren is well known.

(2) An alternative method is to give two to six tablets of methyl testosterone by mouth every day for about a month. Such tablets are made by Organon Laboratories Ltd., under the name of neo-hombreol (M). Each tablet contains 5 mgm. of methyl testosterone. This is a convenient method of continuing treatment, if the injections appear to have been satisfactory to start off with. The drug can also be administered in the form of linguets made by Ciba in 5 mgm

tablets, to be sucked under the tongue. (3) Methyl testosterone may also be administered by means of an ointment and suppository, made up in various strengths, but these are of more use in the treatment of certain conditions of frigidity.

It is important to realize that in a large proportion of cases of functional male impotence the condition is largely psychological and needs the most careful investigation from that point of view. Any drug treatment must be regarded in the nature of an adjunct to this psychotherapy. Investigation must be made into the individual's up-bringing, life pattern, attitude to sex, possible frights and sexual shocks in childhood, and such-like. In addition the cooperation and understanding of the partner is essential, and it is most important to inquire into the methods of sexual technique, contraception, and so on. I have often found that the discontinuation of a sheath by the male and the employment of an adequate contraceptive method by the woman, i.e., cap and chemical, have a most beneficial effect on these conditions. Nevertheless, there can be little doubt that in many of the cases which appear to be mainly psychological there is an element of endocrine dysfunction which is often benefited materially by the judicious administration of methyl testosterone. Thus the effective treatment of this troublesome condition is best effected by a combination of endocrines, psychotherapy and re-education in the sexual field.

EDWARD F. GRIFFITH, M.R.C.S

NETTLES IN RHEUMATISM

DR F. R. NEUBERT writes — In the September issue of *The Practitioner* you published a letter from 'Country Reader,' who asked whether or not there was a scientific explanation for the relief of rheumatism after stinging by nettles. I send herewith that explanation — It was suggested by Hippocrates and Paracelsus and later proved by Hahnemann and Professor Schulz of Griefswald, that certain substances which produce abnormal conditions in a healthy body, relieve similar conditions when produced by disease. This forms the basis of homœopathic therapy in which *Urtica urens* (nettle) may be prescribed for the relief of rheumatism of like symptoms. This is, however, not a specific remedy, as some time ago a cure was claimed by a newspaper reader who had been stung by a swarm of bees. *Apis mellifica* (bee) is a remedy often used by homœopaths for the same purpose, but the symptoms differ somewhat from those produced by *Urtica urens*, or any other homœopathic remedy. Cure only follows the administration of the similar

PRACTICAL NOTES

THE PREVENTION OF IMPETIGO
NEONATORUM

THE report of a survey of the incidence of impetigo in the new-born nurseries of the obstetrical wards of the Hahnemann Medical College and Hospital of Philadelphia over a seven year period, during which time three methods for cleansing the skins of new-born infants were employed, indicates the value of an antiseptic baby lotion comprised of cetyl trimethyl ammonium bromide 0.16 per cent with boric acid, lanolin and mineral oil (Vick Chem Co., N.Y.) The report is given by C. C. Fischer (*Archives of Pediatrics*, July 1944, 61, 352). During the first period of two-and-a-half years, from January 1937 to July 1939, sterilized cotton-seed oil was used for cleansing from birth onwards, and additional oil after the change of napkins. There was an incidence rate of 0.94 per cent in 2,439 new-born infants. The second period was from August 1, 1939, to July 31, 1941, and the "no bath technique" was employed, the skin of the new-born infants being left untreated, except for the removal of excessive blood with sterile cotton-wool, until the seventh day, when a gentle soap and water sponge bath was given, followed by daily baths and applications of sterilized peanut oil. The incidence rate during this period was 0.85 per cent in 2,009 infants. The third period was two-and-a-half years from August 1941 to January 1944. The "no bath technique" was retained, except that an initial cleansing of the skin was carried out with the antiseptic baby lotion on the fifth day, and thereafter the lotion was applied daily and after each change of diaper. A total of 3,520 infants were treated and not one single case of impetigo occurred. No changes in nursery layout, equipment, laundry or care of linen and other supplies were made during the entire seven year period. Sometime after the observation period, two premature infants in incubators, who had not received the antiseptic lotion, developed severe impetigo. No attempt at isolation of other infants was made, four cases developed among the lotion-treated infants but the disease did not assume the widespread bullous character of the incubator cases, being confined to single blebs which dried up and disappeared promptly without spreading. The advantages claimed for the antiseptic lotion are—(1) Easy application, (2) freedom from irritative and sensitivity reactions, and (3) ability to inhibit the growth of infecting organisms. It is suggested that for successful prophylaxis a modification of the "no bath technique," in that no attempt be

made to remove the vernix caseosa or otherwise cleanse the infant's skin and that the antiseptic lotion be applied freely from birth onwards, with special attention to the groins, axillae and folds of the neck, should be adopted.

SULPHONAMIDE THERAPY
IN INFECTIVE RHEUMATISM

DURING the period 1939 to the beginning of 1943, forty cases of infective rheumatism, twenty-three acute and seventeen chronic, were treated with sulphonamides at the Hospital del Salvador, Santiago. The results are recorded by H. Alessandri and M. Losanda (*Revista Medica de Chile*, May 1944, 72, 403). The acute cases included thirteen of gonococcal origin, three due to focal infection, six of unknown etiology, and one case of mixed infection (blenorragia and Nicolas-Favre disease). In 25 per cent. of these cases there was a coexisting syphilitic infection. The drugs employed were sulphapyridine, sulphanilamide, sulphathiazole and combinations of sulphonamides. Complete cure was obtained in nine of the thirteen cases of gonococcal origin. In all, in this group the complete cure rate was 57 per cent. The dosage employed was over 4 gm. daily in eighteen cases; the total dosage for cure being 22 gm. minimum and 73 to 99 gm. maximum. Failures in this group were 10 per cent., the remaining patients being partially cured. In the chronic group there were fifteen cases of gonococcal origin, in seven of which favourable results were obtained, as also in one case of mixed and one of focal infection. Supplementary treatment, in the form of hyperthermia, X-rays, vaccine and protein therapy, was given in some cases. In conclusion, the authors state that the results indicate that sulphonamide therapy is as effective, and much less inconvenient for the patient, as pyretotherapy in the treatment of blenorragic rheumatism, in chronic cases in which sulphonamide therapy in combination with focal treatment fails, it is necessary to have recourse to pyretotherapy and electropyræxia.

THE DIAGNOSTIC VALUE OF THE
BLOOD SEDIMENTATION RATE IN
DIARRHOEA

ACCORDING to W. C. Alvarez and J. A. Barga (*Proceedings of the Staff Meetings of the Mayo Clinic*, May 17, 1944, 19, 255), the blood sedimentation rate is of great assistance in the differentiation of cases of functional diarrhoea from those due to severe organic lesions of the bowel. If the sedimentation rate is low, there is little chance that organic disease will be found,

whilst if it is high (e.g., more than 40 mm. in an hour by the Westergren method), there is almost certainly something seriously wrong with the bowel. On several occasions, it is claimed, a raised sedimentation rate has been the first clue in the detection of a lesion in the bowel which had hitherto been missed but which was responsible for a diarrhoea previously diagnosed as of nervous origin. Conversely, cases of diarrhoea in which the degree of pyrexia, prostration and pain suggested some serious organic cause, have turned out to be of benign origin when the sedimentation rate was normal. These workers have also found that the sedimentation rate is of value in the diagnosis of the extent and severity of the lesion in ulcerative colitis, when only the rectum and sigmoid-colon are involved the rate may be within normal limits.

THE TREATMENT OF CHRONIC AMOEBIASIS

Using a mixture of powdered ipecacuanha 0.15 gm and yatren 0.40 gm., fifty cases of chronic amoebiasis have been treated at the Yarkon Government Hospital, Tel Aviv, and the results are recorded by S Btsh (*The Palestine and Near East Medical Journal*, July-August 1944, 3, 107). The powder was given twice daily in the form of cachets or gelatin capsules, the best time for taking the mixture being three to four hours after breakfast or dinner, a period of at least one hour fasting being allowed after administration. The treatment is continued for twelve to fourteen days, and can then be followed by a short course of carbarsone (2 tablets daily for six to eight days). During treatment the patient should not be allowed too much freedom of movement, although he can get up, but the treatment is not recommended for ambulatory patients. In most cases the amoebic cysts disappear from the stools within eight to ten days of treatment; symptomatic relief occurs within the first ten days, the tenderness along the tract of the colon and the cord-like thickening of the sigmoid colon disappearing. In some cases cysts may still be present in the stools at the completion of treatment but disappear within a few days. The only reactions noted were a slight nausea in some cases and a slight diarrhoea, neither severe enough to interfere with the treatment. Of the fifty cases treated only one relapsed, twenty patients were followed up for periods ranging from three months to one year and in no case did examination of the stools reveal the presence of amoebae or their cysts. In three cases in which a positive fixation test was present before treatment, the test was negative on examination six weeks later. The substitution of iodoform 0.20 gm. for the

yatren in the mixture is not recommended as, although equally effective, it is less well tolerated.

INTRAVENOUS INFUSIONS

The large-scale use of intravenous infusions in the treatment of shock has emphasized the difficulty which is often encountered in maintaining a sufficiently rapid flow of the transfusion fluid. As the result of a careful investigation of the whole problem, H. E. Pugsley and R. F. Farquharson (*Canadian Medical Association Journal*, July 1944, 51, 5) have found that the factors controlling the rate of flow of such infusions given by the gravity-drip method are: (1) the size of the vein at the site of infusion, (2) the temperature of the fluid as it enters the vein, (3) the nature of the fluid; (4) the pressure of the fluid. Infusions given into large veins (i.e., veins with an outer diameter of 5 mm. or greater), such as the median cubital vein, always flowed rapidly, the temperature and nature of the fluid having little effect on the rate of flow. In the case of small veins, however (i.e., veins with an outer diameter of 2 to 4 mm.), such as the long saphenous vein at the ankle, the temperature of the fluid had a marked effect, cooling of the fluid causing contraction of the vein with pronounced slowing of the rate, an increase in temperature produced veno-dilatation and accelerated rate of flow. A point that is emphasized by these workers is that cooling or heating the fluid in the container is of little avail, as the fluid may have returned to room temperature by the time it reaches the vein, the heating (or cooling) of the fluid has to take place immediately proximal to the needle. Human serum and reconstituted dried plasma were found to contain a factor which caused marked sustained contraction of the vein with consequent slowing of the rate of flow; this factor was not demonstrated in fresh citrated whole blood, fresh citrated plasma, physiological saline, or 5 per cent. dextrose solution. It was found that blood stored for eight to eleven days flowed more slowly than did fresh preparations. Whilst increased pressure resulted in a more rapid flow when the vein offered little resistance, it was not only useless when the vein was contracted but also caused considerable pain at the site of infusion. The practical implications of this investigation are that in the shocked patient a large vein should be selected for the infusion whenever possible. Should it be necessary to use a small vein, and the rate of flow is unsatisfactory, fresh citrated blood or plasma should be used and the fluid should be warmed as it enters the needle, this can be accomplished by coiling the tube between hot-water bottles just proximal to the needle. Such heating will be just as effective in the case of serum and reconstituted dried plasma.

REVIEWS OF BOOKS

Surgery A Textbook for Students By CHARLES AUBREY PANNETT, B Sc., M.D., F.R.C.S. London Hodder and Stoughton Ltd, 1944 Pp vii and 740 Illustrations 389 Price 35s

ANYONE who has examined students realizes that the appearance of a new textbook is an important event, owing to the great influence exercised by the standard textbooks on the undergraduate. In general, the monograph, because of its continuity of approach and treatment, holds its popularity with students in spite of the obvious weakness that in part the author is of necessity dealing with aspects of surgery of which his knowledge is secondhand. The author has clearly shown in this book that his interests in surgery are wide. His approach is practical rather than academic, and the student using this book will find it describing and explaining what he is at the same time seeing in the out-patients and wards of surgical disease and its treatment. The author has deliberately omitted pathological details—"The fundamentals of pathology and bacteriology are taught by pathologists and must be read in textbooks devoted to this science." Whilst this omission leaves more room for clinical description, in the opinion of the reviewer it does tend to leave the book without a satisfactory principle of approach e.g., in the sections on the breast and the thyroid. But the author has succeeded in producing a book which is easy to read, which gives a generally sound and sufficiently full account of present-day surgery and which has a sufficiently individual flavour to justify a new textbook. The inclusion of a special chapter on the hand is to be commended. As points of criticism, the effects of the chemotherapeutic revolution on the practice of surgery are perhaps not sufficiently stressed, e.g., in the treatment of osteomyelitis, and the possibilities of X-ray therapy are not sufficiently appreciated, e.g., in the treatment of secondary carcinomas of bones. The book is satisfactorily produced, having regard to war-time conditions, the print is easy to read, and the semi-diagrammatic illustrations admirably fulfil the purpose of illustrations, to amplify and elucidate the text. It should prove a popular students' textbook.

Regional Anæsthesia By H W L MOLESWORTH, F.R.C.S. London H K. Lewis & Co Ltd, 1944 Pp viii and 90 Illustrations 42 Price 8s 6d

THE author of this little book is a general surgeon practising in Kent. He has used regional anæsthesia on 1,500 patients, including

500 requiring major operations, and is convinced of its usefulness in selected cases. In this volume he gives the results of his experience. Although the text fills only eighty-six pages there is much useful practical advice, both as regards technique and also on the general management of a case. As the author admits, it is in no sense a textbook on the subject, but information is given on most operations which are included in what is sometimes called bread-and-butter surgery. The author wisely remarks that the patient is entitled to have some say in the choice of anæsthesia, and also that the presence of an audience is sometimes detrimental to the success of an operation under regional anæsthesia. This book should appeal chiefly to general surgeons who sometimes make use of regional anæsthesia and who are glad to compare notes with another working in the same field. It should be noted that the manufacturers of percaine have now given up this name in favour of nupercaine.

The Rehabilitation of the Injured Occupational Therapy By JOHN H C COLSON, C.S.P., M.A.O.T. London Cassell and Company Ltd, 1944 Pp xvi and 226 Figures 196 Price 15s

MR. COLSON is one of the pioneers in the field of rehabilitation, and this is the first of a series of textbooks which he is writing on different aspects of the subject. He is certainly conversant with the details of occupational therapy and he has a happy knack of clear description. After several pages of tables, which really summarize the whole volume, Mr. Colson gives some introductory chapters on the theoretical background of the main subject of the book. This is a series of twenty chapters dealing with specific or remedial occupational therapy as provided by such work as handicrafts, woodwork, gardening, and so on. Each chapter starts with a section on "remedial use" dealing with indications, analysis of the craft required and the remedial application of the movements involved. Then come sections on "craft technique" and "constructional work" which give clear working instructions for the craft selected. The illustrations are well chosen and beautifully reproduced. The standard is not too difficult for occupational therapists and not too elementary for surgeons. Both will find much of great value in Mr. Colson's textbook. Occupational therapy has long passed from the "arty crafty" stage, and as Mr. E. A. Nicoll, F.R.C.S. Ed., says in an introduction, it must now be regarded as "a valuable part of any system of rehabilitation."

REVIEWS OF BOOKS

Notable Names in Medicine and Surgery
By HAMILTON BAILEY, F.R.C.S., and W J
BISHOP, F.L.A. London H K. Lewis
& Co Ltd, 1944. Pp viii and 202
Illustrations 142 Price 15s

This compilation of biographical notes on distinguished members of the medical and surgical professions, whose names are in common use in medicine in connexion with their outstanding achievements, should make a warm appeal to medical students who have not as yet made a study of the history of medicine. It is well illustrated and each biographical sketch is accompanied by a portrait. A particularly interesting note is that on William Henry Welch, who died in 1934, and whose name will go down to posterity as the discoverer of the *Bacillus Welchii* when he was professor of pathology at the Johns Hopkins University, Baltimore.

Aids to Clinical Pathology By D HALER,
M.B., B.S., D.C.P. London Baillière,
Tindall & Cox, 1944. Pp viii and 358
Price 6s.

This little book has been written to replace the mer members of the Aids series "Pathological technique" and "Practical Pathology." The text is divided into eight sections, post-mortem technique, histology, cytology, haematology, bacteriology, serology, parasitology and biochemistry. The best part of the book is that which deals with biochemical methods and the worst the sections on haematology and bacteriology. A number of surprising statements are made, e.g., p 51, "The most spectacular of the nucleated red cells is the megakaryocyte it is the parent cell of the red blood discs platelets are derived from the extrusion of segments of its nucleus," and again, on p 58, "the reticulum of the reticulocyte may represent the gaps through which the pyknotic nucleus of the immature red blood cell has been extruded." The use of safranin for ten seconds only as a counterstain in Gram's method cannot be recommended. This book may have a place as a convenient pocket compendium of methods, but the general text contains too many doubtful statements to be entirely relied upon by the student.

Penicillin in Warfare (The British Journal of Surgery) Bristol John Wright & Sons Ltd, 1944. Pp 224. Figures 128. Price 12s 6d

This special issue of the *British Journal of Surgery* comprises a series of articles on the use of penicillin in warfare, none of which has been previously published in other journals. An

article on penicillin therapy in gonorrhoea deals with the results obtained in 1,000 sulphonamide-resistant cases and 100 acute cases previously untreated, the response to treatment being outstandingly good. The value of penicillin in the treatment of gas-gangrene is the subject of two articles, and there is an interesting account of its successful prophylactic use in wounds of aerial warfare. Other contributions deal with the use of penicillin in different types of war wound, including those of the head and spine. There is an excellent bibliography, in all comprising 448 references. Both authors and publishers are to be congratulated on the production of this useful symposium on a subject which is of vital interest at the present time.

NEW EDITIONS

COMPLETE revision and rewriting has been undertaken in the preparation of the second edition of *A Concise Pharmacology*, by F G HOBART, PHC, and G MELTON, M.D., M.R.C.P. (Leonard Hill Ltd, 12s 6d.) As is well known, the book emanates from the Westminster Hospital, and this fact is expressed with gratification in the Foreword by Sir ADOLPHE ABRAHAM, O.B.E., M.D., F.R.C.P., formerly Dean of its medical school. The authors' method of compilation, whereby the general usage of the different drugs is indicated as well as their clinical application and dosage, renders the work of real value to the general practitioner.

In the four years that have elapsed since the appearance of the first edition of *Pharmacology* by J H GADDUM, Sc.D., M.R.C.S., L.R.C.P., a number of new drugs have been discovered and perfected. Thus in the preparation of the second edition (Oxford University Press Humphrey Milford, 21s) much additional material has been included, among which are sections on penicillin, CTAB, new sulphonamide derivatives, toxicity tests, and tests for alcohol in urine and blood. A useful key to the interpretation of chemical names is a welcome feature of the new edition.

THE use of massive doses of diethylstilboestrol in the treatment of carcinoma of the prostate is included in the section devoted to male endocrinology in the second edition of *Office Endocrinology*, by ROBERT B GREENBLATT, M.D., C.M. (Charles C Thomas, Illinois. Baillière, Tindall & Cox, 22s). The book has been subjected to complete revision in the preparation of the new edition, and the result is a most useful compendium of the vast subject of endocrinology which, in view of its essentially practical character, will be warmly welcomed by practitioners. The new edition is well illustrated, and there is a short bibliography at the end of each chapter.

NOTES AND PREPARATIONS

NEW PREPARATIONS

ALUM-PRECIPITATED WHOOPING-COUGH VACCINE—Investigations carried out in America have indicated that a high level of immunity can be obtained with a smaller total dosage of alum-precipitated whooping-cough vaccine than with the suspended vaccine. Glaxo Laboratories Ltd., Greenford, Essex, have placed on the market an alum-precipitated vaccine which is available in bottles of 5 c.cm., price 10s 9d, and 10 c.cm., price 15s 6d. This firm has also issued EXAMVEN liver extract in a new potency. The extract, a note on which appeared in *The Practitioner*, July 1937, 139, 104, is now obtainable in a highly concentrated form in ampoules of 1 c.cm., in packs of three, price 13s 4d, and six, price 25s. It is also issued in bottles of 5 c.cm., price 15s. It is claimed that the concentration of the anti-anæmic factor in the new product is such that equal therapeutic results can be obtained by the injection of 1 c.cm. as by the former use of 3 or 4 c.cm. Further particulars can be obtained from the manufacturers.

ROYAL MEDICAL BENEVOLENT FUND "CHRISTMAS GIFTS"

SIR THOMAS BARLOW writes—"Once again it is my privilege to appeal to your readers throughout the country to remember the beneficiaries of the Royal Medical Benevolent Fund. These beneficiaries are aged or infirm medical practitioners, their widows and dependants, and as an old man myself—now in my 100th year—I have their welfare much at heart." In spite of war-time conditions, last year the response to the appeal permitted the distribution of £3 to each beneficiary, and it is hoped that this year contributions will be equally, or even more, generous, so that not only may the recipients benefit, but the well-loved President may regard the response as a personal tribute to his long and untiring efforts for the less fortunate members of the medical profession. Donations should be sent to the Honorary Treasurer, Royal Medical Benevolent Fund, 1, Balliol House, Manor Fields, Putney, London, S W 15, marked "Christmas Gifts."

THE BOARD OF REGISTRATION OF MEDICAL AUXILIARIES DIETITIANS

THE first Register of Dietitians has just been published by the Board of Registration of Medical Auxiliaries, and contains the names of members of the British Dietetic Association in England, Scotland, Wales, Ireland and Overseas, in all some 140 dietitians, who undertake work in connexion with diet under the control of registered medical practitioners. Copies of the

register can be obtained from the Secretary, Board of Registration of Medical Auxiliaries, B.M.A. House, Tavistock Square, London W C 1.

THE ROYAL SOCIETY OF MEDICINE BUILDING FUND

IN view of the changes and advances in medicine in recent years, and especially the growth of use of the cinematograph film, which calls for apparatus, extension of library facilities and space for exhibition of films, the present building at 1, Wimpole Street is proving inadequate. It is therefore proposed to adapt the house to modern requirements and to develop and extend the library facilities, so that not only will more ample services be available to Fellows (whose number has increased threefold since 1910) but it will be possible to continue to permit the use of the library by workers in and in medicine, whether medically qualified or not. A sum of £50,000 is needed for building a reconstruction, and an appeal is being launched now so that the Building Fund may have attained workable proportions by the time building permit is obtained. Contributions should be sent to the Secretary, Royal Society of Medicine, 1, Wimpole Street, London, W 1.

EDITOR OF THE LANCET

The *Practitioner* welcomes the recently announced appointment of Dr T. F. Fox as Editor of *The Lancet*, the oldest medical journal in this country. Dr Fox will be the sixth editor since its foundation in 1823. He succeeds Dr Egbert Morland, whose work for medical journalism deserves the gratitude of the whole profession.

CONTENTS FOR JANUARY, 1945 MIDWIFERY

The General Practitioner and a Midwife Service By Eardley Holland, M.D., F.R.C. F.R.C.S., P.R.C.O.G.

Difficult Labour By Hector McLennan, M.D. F.R.F.P.S., M.R.C.O.G.

Modern Views on Toxæmia of Pregnancy By J. Eric Stacey, M.D., F.R.F.P.S., M.R.C.O.G.

Diagnosis and Treatment of Hæmorrhage in Late Pregnancy By Arthur C. Bell, M.B., F.R.C. M.R.C.O.G.

The Care of the Premature Baby By V. Ma Crose, M.D., D.R.C.O.G., D.P.H.

Child Health VII—Residential Schools for Handicapped Children By John D. Kershaw, M.D., D.P.H.

